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CONDITION AND PLOUGHING OF SOILS IN VINNYTSIA OBLAST

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ABSTRACT
The problem of nature protection for Vinnytsia region, most of the territory of which is experiencing almost uncontrolled intensive economic activity, is very relevant. Natural conditions and resources of Vinnytsia are diverse and unique, today the question of their rational use is still insufficiently studied. Preservation of modern nature, increasing its wealth, is impossible without a detailed knowledge of history. It is the knowledge of the past that helps us to better understand the present and predict the future state of nature of the region, the possibility of its reconstruction not only by preserving but also creating new environmental facilities. Modern development of human activity is often harmful to the environment due to the growth of urban planning, industrial production, traffic. Therefore, there is pollution of water, air, soil, which negatively affects the health of the population, poses a threat to the environment, exacerbates environmental problems.
Keywords: Soil, humus, nutrient medium, humus balance, acidity, reaction of soil environment.

Development and economic activity, in the course of which the man is exhausting and polluting more and more natural resources, have caused imbalance in the environment. The current ecological situation requires immediate measures to solve it. Currently searching for ways to overcome environmental problems, depend on the humanitarian potential of society, the level of education and culture, the management of people [1].

Agrarian Ukraine has 42 million ha of arable land (more than 70% of the territory) of which 32,5 million ha is arable land (about 55%). A significant cause of arable land degradation is a scientifically unjustified crop production, the spread of water erosion on 32% of arable land, vitro-water erosion - on 20%. Acidic soils occupy 25,8%, saline soils - 4,1, saline - 5,4; overmoistened - 4. The content of organic matter (humus) in arable lands of Ukraine decreased twice, in some fields - 3-4 times. Through the intensification of agriculture buffer capacity of soils is exhausted, self-purification processes are hampered, useful microflora and microfauna die out, biological agrotechnical properties of soils deteriorate, groundwater and crops are polluted [2].

Modern ways of using land resources in Ukraine do not meet the requirements of balanced nature management. Negative consequences of disturbance of relationship between lands results in intensification of degradation processes (water, wind erosion), loss of soil fertility (reduction of humus content, soil compaction, upsetting the balance of biogenic elements, secondary geochemical anomalies, etc.) and impoverishment of biodiversity and, consequently, reduction of land productivity. To date, the ecologically acceptable ratio of arable land, natural fodder land, forest plantations, negatively affects the sustainability of agrolandscapes [3].

Soil as a component of the biosphere should be subjected to scientifically sound and rational use. For this purpose, the state monitors the qualitative condition of soils through agrochemical certification of agricultural lands, during which more than 20 indicators of their fertility are determined.

The most important component of soil and defining indicator of its fertility is humus, the energy level of processes taking place in soil and plants grows as its reserves increase. Humus activates biochemical and physiological processes, enhances the metabolism and the overall energy level of processes and plant organism, promotes the intake of elements of nutrition, ultimately accompanied by an increase in yield and improvement of its quality [5, 4].

According to "Centrgosplodrodolodiya", the content of humus in arable land is: Polesie - from 1.50 to 2.24%; Forest-steppe - from 3.19 to 3.22%; Steppe - from 3.40 to 3.60%. These figures were determined on the basis of surveys of soils of V-IX rounds. During the last two decades a decrease in soil fertility has been observed. First of all it concerns reduction of humus content - an integral indicator of soil fertility. During this period in Ukraine its content decreased on average by 0,22% [6].

During agricultural production it is very important for agricultural producers to know about reaction of soil solution. Analysing problem of reaction of soil solution in Ukraine we can conclude that area of acidic soils continuously grows due to redistribution of area from neutral to weakly and moderately acidic groups. Areas of acidic soils occupy about one third of the surveyed areas and are found in 17 oblasts of different zones of Ukraine, or occupy almost 7 million hectares of agricultural land. Most acidic soils are concentrated mainly in the Polissya zone [7].

Another negative result of human activity is soil erosion. Soil erosion is one of the most pressing problems of our time. The area of agricultural land that is affected by water erosion in Ukraine is 13300000 hectares. Hectares (32% of the total area) including 10600000. ha of arable land, and crop yields on eroded soil are 20-60% lower than on non-eroded soil. As a result of water erosion about 500 million tons of humus, as well as about 1 million tons of nitrogen, 0.7 of phosphorus and over 10 million tons of potassium are washed away annually [8-9].

The main reason for the decrease in soil fertility is the violation of the laws of farming. Human economic activity is the dominant factor in transformation of soils, namely destruction, deterioration or increase of their fertility. Analysis of operational and statistical reporting indicates that the vast majority of land users do not use any measures aimed at the conservation of soil and increase their fertility [10].

Under current agricultural practices, soils in Ukraine are degraded for the following reasons high ploughing of land has led to intensive development of erosion processes, resulting in extremely high annual losses of fertile soil; no measures are taken to protect and reproduce soil fertility increase of the area under energy-saturated crops - sunflower, rape, maize has worsened the phytosanitary condition of soils, increased the manifestations of erosion and drought phenomena, led to agrochemical degradation of soils; not enough organic matter and mineral fertilizers are applied, negative balance of nutrients and humus is observed; the area of acidic soils is steadily increasing.

Soil erosion is one of the most pressing problems of our time. The area of agricultural lands affected by water erosion in Ukraine totals 13300000 ha. Hectares (32% of the total area) including 10600000. ha of arable lands, and the crop yield on eroded soils is 20-60% lower than on non-eroded soils [11].

Soil pollutants, as defined by WHO experts, should be understood as chemical substances, biological organisms and products of their vital functions, which occur in the wrong place, at the wrong time and in the wrong quantity. Soil contamination should be understood to mean only that content of chemical and biological contaminants that pose a health risk through direct human contact with the soil or through media in contact with the soil, through the ecological chains: soil - water - human; soil plant - animal - human, etc.

Soils can be polluted as a result of application of mineral and organic fertilizers, use of pesticides, influx of industrial and domestic wastes of various kinds, applied as fertilizers and for the purpose of moistening, including application of wastes of livestock complexes; ingress of chemical substances to its surface by emissions of industrial enterprises and motor transport, as well as radionuclides due to accidents at nuclear reactors; storage and permanent burial of domestic and industrial wastes.

Characterizing the soil cover of Vinnytsia oblast, materials of the report "About the state of the environment in Vinnytsia oblast (2019)" [12] should be noted that the main land areas, on the state of which the economic situation in the region to a large extent depends, are lands of agricultural and forestry purpose and natural-reserve fund.

The biggest part of the territory - 2064,0 thou.ha (77,9% of the total area of the region) is occupied by agricultural lands, of which: agricultural lands - 2014,2 thou. hectares (76,0% of total area), including 1725,5 th.ha of arable lands (65,13% of total area), 1,0 th.ha of fallow lands (0,04%), 51,4 th.ha of perennial plantations (1,94%), 263,3 th.ha of hayfields and pastures (8,92%). Forests and other wooded lands comprise 380,3 thou.ha (14,36% of total area), built-up areas 107,7 thou.ha (4,07%), marshy lands 29,1 thou.ha (1,10%), open lands without vegetation cover or with slight vegetation cover 25,0 thou. ha (0,94%), inland waters 49,4 thousand ha (1,86% of total area) and other lands (farmyards and roads, sands, ravines, "silty places", etc.) 49,4 thousand ha (1,86%). Land area (without wetlands and inland waters) constitutes 2605,700 ha or 98,3% of total area.

The part of agricultural lands in regard to the land territory (degree of agricultural development) in the region is 77,3%, and in regard to the districts - from 67,3% to 87,7%. Ploughed relative to the land area in the oblast is 66.2%, and in the districts from 53.6 to 79.7%.

Table 1

Structure of the region's land fund

Main types of land	Total, thousand ha	% of total area
Total area	2649,2	100
Including:		
1. Agricultural land	2014,2	76,03
2. forests and other wooded areas	380,3	14,36
3. constructed land	107,7	4,07
4. open wetlands	29,1	1,10
5. Open lands with no or little vegetation cover (sands, gullies, lands occupied by landslides, gravels, pebbles, bare rocks)	25,0	0,94
6. Other land	49,4	1,86
Total land (land)	2605,7	98,4
Areas covered by surface water	43,5	1,64

Agricultural development of the region's territory is very high - 76.0% of the total area of the region (67.2-87.7% in districts). Ploughing is 65.1%. The average tillage of soils in Ukraine is 78.4%.

In the structure of agricultural land use of the region prevails arable lands - 1725,5 th.ha. (500 ha more than in the previous year), perennial plantations occupy 51,4 th.ha. (100 ha less than in the previous year), pastures and hayfields - 236,3 th.ha. (600 ha less than in the previous year).

On classification of soils and lands of Ukraine and their suitability to the agricultural production Vinnytsia soils by fertility are from the fourth (70-61 points) to the eighth (30-21 points) class. These soils from high fertility (good soils) to the group of soils of low quality

(low-value lands) on general classification of soils and lands of Ukraine.

The main soils in the oblast are black soils (50.1% of agricultural land area) and grey forest soils (almost 33%). More than half of the surveyed agricultural lands of the oblast are acidic.

Table 2

Main indicators of soil quality

Agrochemical indicators	*Regional average*
Content of organic matter (humus), %	2,69
Content of easily hydrolysed nitrogen,No.mg/kg soil	80
Content of mobile forms of phosphorus, P2O5 mg/kg soil	87
Exchangeable potassium content, K20, mg/kg soil	108
Soil solution reaction (acidity), pH	5,5

The balanced or average humus content for the region is 2.69%, which is quite low. According to scientific research, it is necessary for the soil to contain at least 2.5% humus in the arable horizon in order to maintain physico-chemical and biological processes at a sufficient level. This level is considered critical, below which the agronomically valuable properties of the soil deteriorate noticeably. This is due to the fact that the application of organic fertilisers in the area is critical. There are 523,7 thousand hectares of soils with humus content below critical level, that is 41,4%.

According to agrochemical survey tours of agricultural lands in the region the average humus content in soils is 2.88 to 2.70% (by zones of the region).

Table 3

Content of trace elements in soils

Agrochemical indicators, mg/kg	*Regional average*
Boron	0,56
Manganum	12,6
Cobaltum	0,71
Cuprum	0,27
Zincum	1,94

The share of agricultural land relative to the land area (degree of agricultural development) is 77.3% in the oblast, and from 67.4% to 87.7% in the districts. The share of ploughed land relative to the territory of the region is 66.3%, and in the districts - from 53.7% to 79.6%.

Almost 25% (672,8 thousand ha) of all agricultural lands are exposed to water erosion, 7% (179,7 thousand ha) are exposed to wind erosion, 57% (1511,0 thousand ha) to acidic soils. Occurrence and development of erosion processes is connected to many reasons. One of them is irrational land use, which is promoted by: intensive plowing of sloping lands (more than 30) and cultivation of tilled crops on them (especially sugar beet); lack of complex approach in conducting anti-erosion measures; oversaturation of structure of sown areas with tilled crops. Furthermore, inefficient land use leads to a loss of soil fertility.

Altogether 737,3 thousand ha of degraded and low-productive lands are in need of conservation (27,8% of the total territory).

A level of natural soil fertility is first of all assessed by humus content. There are 523,700 hectares of soils with humus content below the critical level, or 41.4%.

During the period 2006-2010 and 2011-2015 (two rounds of survey) agrochemical and analytical studies have shown, that the soil cover of the region and its provision with nutrition elements has changed insignificantly. Qualitative indicators of soil fertility with each round of agrochemical survey partially decrease, so it is necessary to constantly carry out appropriate rruntoohoring measures. Those are, first of all, organic and mineral fertilizers, sowing of green manure, liming of acidic soils (melioration), water erosion control, etc.

The area of soils with lower content of humus (organic matter) has increased. There is a tendency of transition of soils areas from highest to lowest indicators.

Provision of soils of the region with easily hydrolysed nitrogen, mobile phosphorus and exchangeable potassium remains satisfactory. There have been no significant changes in these indicators.

One of the significant factors, negatively influencing soil fertility and leading to a decrease in agricultural yields, is soil acidity. The data of the conducted surveys indicate significant acidification of soil solution. The areas of strong, medium and weakly acid soils have considerably increased. Here also there is a visible tendency of transition from neutral and close to neutral soils to soils with medium or weak acidity.

However, on average, only about 4% of the area requiring priority lime treatment is applied annually. The total demand for chemical meliorants in terms of lime is over 6800000. Tonnes.

Considering zonally, the most acidified zone of soil cover is the Central, partially South. In the Northern zone are quite small areas of acidic soils [12].

It is important to emphasise that the introduction of integrated measures that limit soil acidification can effectively reduce heavy metal emissions, the amount of which in the soil can be reduced by using fertilisers with low metal content, replacing inorganic pesticides with organic products, and using other methods. After all, soil contamination with heavy metals (mercury, cadmium, lead, chromium, copper, zinc and arsenic) is quite dangerous because they are toxic and inhibit the

activity of soil microflora. Contamination of agricultural lands with heavy metals leads to a decrease in yield and an increase in their content in agricultural products.

Assessment of the chemical load of the territory of Vinnitsa district according to the results of instrumental-laboratory control, which was carried out by the State Ecological Inspectorate in Vinnitsa region in 2015:

- An excess of metals content in soils compared to MPC was not observed;

- No exceeding of the norms of pesticides, nitrites and nitrates content in soil was observed;

- exceeding of MPC norms of heavy metals and pesticide residues was observed near toxic waste storage sites, traffic arteries;

The problem of pollution of the environment with heavy metals has been steadily increasing and has now assumed alarming proportions. In many industrial areas of the world man-made biogeochemical zones with abnormally high content of heavy metals in soil have appeared.

On degree of possible negative influence of heavy metals-pollutants on soil, plants, animals and people three classes of danger allocate: highly dangerous; not safe; low dangerous.

The first class includes arsenic, cadmium, mercury, selenium, lead, cobalt, zinc, fluorine. Class II includes boron, cobalt, nickel, molybdenum, antimony, chromium. The third class includes barium, vanadium, manganese, strontium.

The greatest danger to the environment is pollution of soils with heavy metals, pesticides, pathogens of infectious diseases, etc. The soil cover adjacent to large cities with developed industry is contaminated with heavy metals.

From 130 samples taken in the soil of Vinnitsa region for determination of the content of heavy metals, no one exceeds MPC for the content of these elements. The analyses of soil samples on the content of heavy metals shows that the highest content of manganese - 50-121 mg/kg in the soils of the region. Heavy metal concentrations of copper, zinc, nickel, cobalt and manganese have been detected at minimum levels in relation to MPC.

On selected highways with high traffic volume, it is necessary to exercise strict control over the use of land plots along them. In some cases, especially in the absence of tree plantations, sanitary protection strips should be set aside within a radius of up to 100 m, within which no grazing or harvesting should take place.

Soil contamination by nitrates and phosphates. Nitrogen and phosphorus are essential elements for all forms of life and are therefore also important for soil crop biocoenoses. However, excessive use of mineral fertilisers causes nitrate and phosphate pollution of soil and groundwater. The extent of contamination depends on soil type, local climate and agricultural practices.

As we can see from Table 3, nitrate content in soils of the district did not exceed maximum permissible levels, so the pollution index for nitrates was 26.5 mg/kg, phosphorus content was 35 mg/kg. Regarding MPC of nitrogen - potassium fertilizers and it was 120 mg/kg and only 45 mg/kg was detected in the soils of the district.

Nitrogen compounds. Nitrate pollution is a problem that worries the whole world. It is mainly related to intensive agricultural activities. The problem can be solved in the following ways: selection of crops requiring less fertilizer; timely application of fertilizer (in the growing season); application of better plant nutrition; reduction of the grazing season; restriction of pasture exploitation (reduction of livestock in the area).

Thus, the content of heavy metals and other indicators in the soil of Vinnitsa rayon does not exceed the maximum permissible limits for these soils and is considered to be good.

Pesticides are dangerous for the environment.

Their use requires strict compliance with scientifically grounded regulations. The potential for adverse effects of chemical control is primarily due to the ability of pesticides to cause acute poisoning and the likelihood of contamination of the biosphere with harmful chemical compounds. The criterion for toxicity of a preparation is the dose (the amount of the substance entering the body), which causes the death of 50% of experimental animals (LD 50) and is measured in mg/kg body weight. The potential hazards of environmental and food contamination depend on the stability of the chemical, characterised by its half-life (T) - the time in which the amount of the poisonous substance in the test object is reduced by 50%. Pesticides are considered practically safe if their dose of LD exceeds 1000 mg/kg and (T) is less than 3 days.

The hazard level of individual preparations is assessed according to an integral classification scale that takes into account toxicological-hygienic and ecotoxicological indicators, has 7 degrees. Pesticides of grades 1 and 2 are characterized as very hazardous, 3 - hazardous, 4 and 5 - moderately hazardous, 6 and 7 - little hazardous.

The dispersal of poisonous substances, which are pesticides, poses a real and potential danger to living organisms. So, in order to prevent possible negative consequences in the planning and implementation of chemical control measures against pests, plant diseases and weeds, it is necessary to comply with scientifically justified ecotoxicological and hygienic regulations.

The pesticide quantities in the soils of Vinnitsa rayon are within normal limits. In order to maintain favourable environmental situation in local and regional scale, it is necessary to regulate the amount and assortment of pesticides at the level corresponding to the intensity of self-purification processes of agricultural landscapes. The main stages in the response of soils to anthropogenic impacts and their evolution from natural to anthropogenic disturbed state:

1) accumulation of chemical pollutants to a critical level;

2) significant change of physical and chemical properties of soils - adverse changes in pH, loss of structure;

3) unfavourable impact of ground conditions on vegetation cover;

4) development of erosion and deflation processes and soil degradation;

5) formation of anthropogenic desert.

When planning and implementing chemical plant protection measures, a comprehensive approach is needed, based on objective criteria for assessing the risk of contamination of the environment and agricultural products, and taking into account the toxicity of pesticides to humans. Preference should be given to agrochemical, biological and breeding-genetic methods of control.

Phosphates. Phosphates accumulate in the topsoil in regions with intensive livestock development. Due to the oversaturation of the soil with phosphorus compounds, they enter and contaminate groundwater and surface water. This process is called eutrophication. In water bodies and reservoirs it is accompanied by a rapid development of algae and their products.

Excessive expansion of arable land, including on slopes, has led to a violation of the ecologically balanced ratio of agricultural land, forests and water bodies, which has had a negative impact on the stability of agricultural landscapes and has caused a significant technogenic load on the ecosphere.

In Vinnitsa region the degree of ploughed area is 68% of the total area of the region. This value shows that the anthropogenic load on our territory has reached a critical level, and therefore the study of climatic, hydrological, biotic balance is the first step to reducing the ploughed area.

Regarding the characteristic of lands of Vinnitsa district, 73310 hectares are fixed on the area, from them the agricultural lands occupy 56717 hectares or 77,4%. The area of arable lands is 50524 ha or 89,1% from the agricultural lands. On the more arable lands in Vinnytsia rayon are in the villages Mizyakivske Hutora - 2913 ha, Stepanovka - 2213 ha, Strizhavka - 2032 ha, Krushlintsi - 2078 ha. Less arable lands are in Medvezhie Ushko village - 229 ha, Aleksandrovka - 974 ha.

Monitoring of soil erosion hazard is observation of soil erosion, its types and factors and conditions of its occurrence. Soil erosion is understood as destruction, transfer and deposition of soil destruction products under the impact of water, wind, mechanical impact of implements and other technical means. The condition of agricultural land has deteriorated significantly in recent decades and has become endangered.

In order to characterise erosion processes, it is necessary to have an idea of the terrain on which the arable land is located. As can be seen from Table 3.10, the largest areas of arable land are located in the flat area - 72,269 ha with 87,244 ha.

The most eroded soils are in the villages of Khizhintsy - 1017 ha, Voronovitsa - 925 ha, Komarov - 313 ha. In such villages as Medvezhie Ushko, Sosenka, Lavrovka and others, there are no degraded lands at all. As it is seen from Table 3.10, there are 4999 ha of eroded lands in the rayon, which is 10% of the total arable land area, including slightly degraded

- 4 057 ha, moderately eroded - 843 ha and highly eroded - 99 ha.

Area of arable lands on slopes up to 3° is 44531 ha of total area of arable lands, from 3° -7° is 4547 ha or 9,1%, more than 7° is 632 ha or 1,3%. The most dangerous for use are arable slopes with steepness more than 3° - 5179 ha or 10,4%.

According to the scheme of erosion zoning of Ukraine this territory is located in the erosion hazard zone, in the area of predominant development of water erosion with predominant influence of rainwater runoff. Among the developed lands, agricultural lands and, first of all, arable lands are most often subjected to washing away. The intensity of soil washing away from the black plough land and black fallow is often up to 300 t/ha per year. However, such washout is observed locally. The average annual estimated washout of fertile soil layer from arable lands is 12.5 t/ha.

On slopes up to 3° it is possible to grow any crops, both cereals and technical or fodder crops. Arable land with a slope of 3° -7° should be converted to pasture. Lands with a slope of more than 7° should be afforested.

The use of perennial grasses in biological farming systems allows to increase productivity of agro-ecosystems and reduce energy costs, which allows to increase the efficiency of eroded lands use. In Vinnitsa district the main type of erosion processes is water erosion. The process of destruction of soils and subsoil rocks under the influence of temporary water flows, accompanied by soil disturbance, transfer and deposition of fine-grained deposits, is the essence of water erosion.

According to the scheme of erosion zoning of Ukraine territory Vinnitsa region is in the zone dangerous in erosive relation, in the area of the prevailing development of water erosion with the predominant influence of rainwater runoff. Among the developed lands agricultural lands and first of all arable lands are most often subjected to washing away. The intensity of soil washing away from the black plough land and black fallow is often up to 300 t/ha per year. However, such washout is observed locally. The average annual estimated washout of fertile soil layer from arable lands is 12.5 t/ha.

Thus, having compared soil acidity with normative data, we note that ecological condition of soils according to indicators of acidity can be referred to precrisis weakly-expressed. Survey on the content of heavy metals - copper, zinc, nickel, cobalt, manganese - showed minimal content of these elements in relation to MPC. The most eroded soils are in some villages and amount to up to 1 thousand hectares within one village.

References

1. Sovhira S. V. Sutnist i strukturni komponenty ekolohichnoho svitohliadu osobystosti / S. V. Sovhira // Ekolohichnyi visnyk. – №4. – 2010. – S. 26-27.

2. Sytnyk K. M. Stan hruntiv i maibutnie liudstva / K. M. Sytnyk, V. M. Bahniuk // Visnyk NAN. Ukrainy. – 2008. – №8. – S. 3-27.

3. Pankiv Z. P. Zemelni resursy: navch. posib. / Z. P. Pankiv. – Lviv: Vyd. tsentr LNU im. Ivana Franka, 2008. – 272 s.

4. Materialy do Natsionalnoi dopovidi Ukrainy pro stan navkolyshnoho pryrodnoho seredovyshcha u 2013 rotsi. «Rehionalna dopovid pro stan navkolyshnoho pryrodnoho seredovyshcha u Lvivskii oblasti v

2013 rotsi». [Elektronnyi resurs]. – Rezhym dostupu: http://www. ekologia.lviv.ua

5. Furdychko O. I. Ahroekolohiia: monohrafiia / O. I. Furdychko. – K.: Ahrarna nauka, 2014. – 400 s.

6. Hrekov V. O. Osoblyvosti provedennia ahrokhimichnoi pasportyzatsii zemel silskohospodarskoho pryznachennia: [Elektronnyi resurs] / V. O. Hrekov, L.V. Datsko // Ofitsiinyi sait UkrNDIPVT im. L. Pohoriloho. – Rezhym dostupu: www.ndipvt.org.ua.

7. Shkatula Yu. M. Praktykum z okhorony zemel. Dlia studentiv ahronomichnoho fakultetu zi spetsialnosti 6.010109 «Ahronomiia». – Vinnytsia: VNAU, 2015. – 218 s.

8. Zubets M. V. Naukovi zakhody rozvytku ahropromyslovoho vyrobnytstva v suchasnykh umovakh / M. V. Zubets // Visnyk ahrarnoi nauky. – №12. – 2010. – S. 6.

9. Tarariko O. H. Adaptatsiia systemy monitorynhu hruntiv do proektu ramkovoi hruntovoi dyrektyvy YeS ta Rady Yevropy / O. H. Tarariko, O. M. Frolova, V. O. Hrekov ta in. // Ahroekolohichnyi zhurnal. – № 2. – 2012. – S. 54-57.

10. Iatsuk I. P. Rol hruntiv u funktsionuvanni noosfery za V. I. Vernadskym / I. P. Yatsuk, V. M. Panasenko // Ahroekolohichnyi zhurnal. – №2. – 2013. – S. 126- 129.

11. Liushyn V. H. Udoskonalennia finansovoho instrumentariiu okhorony zemel / V. H. Liushyn, L. A. Svyrydova, M. A. Umierov // Zbalansovane pryrodokorystuvannia. – №2. – 2016. –S. 70-74.

12. http://www.vin.gov.ua/images/doc/vin/departamentapk/doc/OperMonitor/Dopov/Dop2019.pdf

RICE BY-PRODUCTS - RAW MATERIALS FOR ALTERNATIVE ENERGY PRODUCTION IN UKRAINE

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ABSTRACT

Assessment of bioenergy potential of rice varieties showed that by-products (straw and husk) of Vikont and Premium demonstrate the highest values of energy output; these varieties were studied to establish how the agronomic factors affect the formation of rice productivity with the final products meant for food and straw and husk being a source of bioenergy plant material as a solid biofuel. In field experiments the biggest yields of rice were obtained under applied mineral fertilizers $N_{180}P_{60}K_0$ with seeding rate of 9 million of similar seeds per hectare for Vikont and Premium varieties at the levels of 9 and 8 t/ha, respectively. Thus, the optimal combination of rice farming techniques leads to high yields of the crop, and at the same time, to significant amounts of by-products suitable for further use.

The results of the study showed that rice straw should be used as a source of alternative energy, ricegrowing regions of Ukraine could get heat energy equivalent to the amount released during combustion of 62 million m^3 of gas. The economic effect of the transition from gas heat generators to the biomass heat generators leads to annual cost cutout of USD 192.3 thousand, and the payback period is 1.14 year. An additional source of alternative energy is the rice husk; the payback of launching a rice husk briquetting line is 1.6 year.

Keywords: rice straw, husk, bioenergy, solid biofuel, yield.

INTRODUCTION

Energy deficit is a daunting challenge recently faced by humanity which urges scientists to actively search for effective alternatives of conventional energy sources. One of the most promising ways of obtaining energy is its accumulating by biomass. The effectiveness of producing alternative biological fuels is determined by rational selection of plants types and how intensively the plants form biomass of the necessary chemical composition (A. Bauen et al., 2005). Considering the dependence on gas imports, which price has tripled over the past five years for Ukraine, it's neces-

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