nécessaire d'être guidé par la théorie du processus de nettoyage. Les produits de nettoyage sont associés à la destruction et à la séparation mécanique des contaminants des surfaces des pièces. Par conséquent, l'état principal pour nettoyer les surfaces des pièces. Par conséquent, la principale condition de purification des surfaces est d'augmenter les pressions dynamiques par rapport aux propriétés de résistance (noyau adhésif) de la pollution. Compte tenu des fondements théoriques, le processus de nettoyage, en tenant compte des signes externes, est déterminé par quatre groupes de facteurs - contribution, dérangeant, gestionnaires et week-ends, qui déterminent le processus et caractérisent son état à tout moment.

Des intrants et des facteurs perturbateursne dépendent pas du mode de purification. Le processus peut être influencé par l'augmentation de l'efficacité par exposition uniquement sur les facteurs de contrôle.

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ROLE OF AGRICULTURE IN THE DECARBONIZATION OF THE NATIONAL ECONOMY

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***Abstract:** The paper describes the issues of decarbonization of the economy and the pursuit of carbon neutrality with sustainable economic growth. The authors analyze investment opportunities in the low-carbon agriculture development through the carbon landfills and farms development in Russia. We discuss the advantages in*

the foreign market of enterprises that have staked the low-carbon business building, as well as CO2 emission quotas trading as a new niche of the agricultural sector.

***Keywords**: decarbonization of the economy, carbon neutrality, carbon landfill, carbon farm, agricultural sector.*

Last October, the government approved the Strategy of socio-economic development of the Russian Federation with low greenhouse gas emissions until 2050 [1]. Its goal is to achieve carbon neutrality with sustainable economic growth. The climate projects implementation should begin in the near future: the country should introduce more environmentally friendly solutions, and increase the absorption of greenhouse gases by forests and other natural ecosystems, in addition, it is necessary to move to the collection and processing of carbon dioxide. The largest enterprises with emissions over 150 thousand tons of carbon dioxide equivalent per year from 2022 are required to provide carbon reporting, the first results will appear in 2023 [2].

The strategy contains a list of measures by sector, including agriculture. In particular, the introduction of the precision farming principles, compliance with the norms and timing of fertilizers and agrochemicals, the use of technologies to increase crop yields in crop production and livestock productivity and others are expected in the agricultural sector. It is also necessary to ensure the accumulation of carbon in the soils of grasslands, pastures, and fallow lands.

One way of generating emission reduction units is the development of carbon agriculture (the practice of regenerative, or regenerative, agriculture). The essence of this method is to increase the level of soil carbon and reduce the rate of its loss due to respiration and soil erosion [3]. It involves, in particular, minimal or zero tillage, sowing cover crops and crops with a strong root system, and mulching.

All products imported into European countries will have to be labeled with the so-called carbon footprint. Its computation need special landfills, as according to various estimates, Russian producers will have to pay on this tax an amount ranging from 2 to 6.5 billion euros a year, and the greatest losses are threatened by companies that export non-ferrous metals, natural gas and copper.

Carbon farms are exploring measurement methods, and carbon farms are the place where these methods are put into practice so that we have highly efficient carbon dioxide sequestration technologies for terrestrial ecosystems. After all, plants manage well at extracting CO2 and storing it as plant biomass, like forests, or in the soil. Carbon farms are needed to maximize the absorption of carbon dioxide through the plants and ecosystems, whether they are forests, special plants or agricultural lands where distinct agricultural technologies are used [4].

Carbon landfills are areas where research on climate-active gases is conducted with the participation of universities and scientific organizations [5]. They include the development and adaptation of technologies for measuring above-ground and underground phytomass, soils' agrochemical studies, greenhouse gas emissions measurement and uptake by ecosystems, active use of remote sensing technologies using space and unmanned platforms, development and adaptation of mathematical models for calculating the ecosystem carbon balance at reference landfills.

The first carbon test landfill, launched under the auspices of the Ministry of Education and Science, started up at the biostation of Tyumen State University (TyumSU). It covers the most characteristic types of ecosystems in the region: different types of forests, lakes, swamps, as well as agrocenoses (man-made ecosystems). The Tyumen Carboniferous Landfill will analyze the area for biological mass calculation, plant species composition, and soil conditions, and collect information using unmanned systems and ground-based equipment. All data will also be used in the future to build models for the use of information on the carbon balance at reference landfills in other areas.

At the end of October 2021 a carbon landfill - Ural Carbon - was launched in the Sverdlovsk region. It became the second one among the Russian carbon landfills opened under the program of the Ministry of Education and Science of the Russian Federation. The landfill represents more than 300 hectares of unique taiga ecosystems, where scientists study the peculiarities of carbon dioxide absorption by plants of coniferous taiga.

In total 80 carbon landfills are going to be built in Russia.

The carbon landfills development is also closely connected to carbon farms development.

Carbon farms are a business project. They are densely planted or simply overgrown areas where large amounts of carbon dioxide are absorbed. Once the farm is certified, the landfill owner can sell offsets. By buying them, the importer is exempt from paying carbon tax. Almost any landfill are suitable for such farms, including industrial waste [6].

According to economists, it is a very capital-intensive market, a “second oil”. At the end of 2020, quotas were traded at 32.03 euros per ton on the stock market. According to Reuters, the global carbon market was worth $164 billion in 2018.

The idea of carbon farms emerged in part because of the large amount of abandoned land In Russia. According to various data, there are about 40-50 million hectares. For every three citizens of Russia there is 1 hectare of abandoned land. These areas are overgrown with natural vegetation, including forest. The rates of overgrowth and carbon sequestration in the above-ground and underground biomass on these territories, of course, need to be measured and specified.

The “conserved” carbon has a cost. If we set up a carbon farm and prove that it absorbs a certain amount of CO2, we can sell those carbon units, or credits, to an enterprise that needs to improve its ecological balance. Such a farm appeared just at the Carboniferous landfill in the Kaluga region, where paulownia seedlings were planted among other plants. The tree grows 4-5 meters a year, its ability to absorb carbon dioxide is estimated by scientists to be 15-20 times higher than that of pine.

A Forest Carbon Plantation of 3 thousand hectares is being created in the Voronezh region, where scientists of the Voronezh State Forest Technical University (VLSTU) named after G.F. Morozov will “test” the trees that most effectively absorb carbon. The botanical garden of the Ural Federal University also grows highly productive plants that can be planted in carbon farms.

The plants are unpretentious - wintergreen, do not require increased heat or amount of light, such as Weyrich's gorse, Syrian cotton-grass, spikemoss, and some

other highly productive herbaceous plants. Scientists ensure that the plants can be ecologically recycled,. Some species can be used as biofuel, others as animal feed and still others as human food, such as amaranth [7].

An important role in the decarbonization of the Russian economy can be assigned to soil-saving crop production, which can reduce the carbon footprint and increase the biologization of land resources. The No-Till technology used - the abandonment of plowing - allows for the accumulation of organic matter in the soil, retaining and reducing CO2 emissions, thereby fully complying with the principles of carbon agriculture.

The economic component of the carbon landfills management and farms consists of the agricultural sector development, which allows to solve two problems: on the one hand, to reduce the carbon damage of intensive production and thereby help to mitigate climate change; on the other hand, the high potential of carbon storage by agricultural lands with rapidly growing biomass will allow developing a carbon-saving industry in the region and attract green investments. The course towards the decarbonization of agriculture will lead to increased innovation activity in the regions and will attract green investments in the agricultural sector and technological start-ups that create low-carbon technologies for the industry.

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LE STATUT IMMUNITAIRE ET LA MICROBIOCÉNOSE DES CAILLES

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Résumé : *Dans cette recherche des études approfondies de différentes doses d'extrait de pyrale et d'homogénat d'abeille sur les paramètres biologiques et productifs des cailles sont présentées et la dose optimale d'application est déterminée. L'efficacité et le degré élevé d'influence biologique à doses moyennes sur la nature et le degré des réarrangements morphofonctionnels dans les structures immunocompétentes des organes centraux et périphériques de l'immunité ont été établis.*

Mots-clés: *caille, homogénat d'abeille, organes centraux et périphériques de l'immunité, extrait de pyrale, productivité, paramètres biochimiques.*

Actualité de la recherche. L'utilisation d'extraits d'homogénat de tronc d'abeilles et d'extrait de pyrale a contribué à augmenter l'activité de résistance naturelle (activité bactéricide et lysozymique du sérum sanguin), l'activité phagocytaire des pseudo-éosinophiles sanguins ; l'amélioration de la production de cellules rouges de moelle osseuse de la lignée granulaire des leucocytes, des cellules lymphoïdes et des cellules de la lignée érythroïde ; activation de composants structurels immunocompétents du thymus, le sac de Fabricius. Dans le contexte de l'inclusion d'extraits d'homogénat de tronc d'abeilles et de teigne de la cire dans le régime alimentaire des sursangs, l'équilibre de la flore normale (lactobacilles et bifidobactéries) et des micro-organismes opportunistes (staphylocoques, Escherichia, Clostridia, champignons du genre Candida) a été restauré dans l'estomac et les intestins des oiseaux [3].

L'industrie biologique produit aujourd'hui une énorme quantité de vitamines alimentaires, d'acides aminés, d'enzymes et d'autres stimulateurs de la croissance et