UDC 504.3:636

Complex assessment of load of activity of the enterprises on production of animal husbandry on environment

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The purpose. To develop and offer methodical approaches to complex assessment of influence of enterprises on production of animal husbandry on environment. **Methods.** Versatile techniques are approved**:** calculation, field, and laboratory. **Results.** Standard and own techniques approved by us are characterized and generalized. That has allowed carrying out complex researches of territory near stock-rearing farms on chemical, microbiological and indicator parameters at various times of a year. **Conclusions.** The model is offered of complex assessment of presumably polluted territory.
Key words*: enterprises on production of animal husbandry, environment, pollutants.*

The functioning of livestock enterprises can create a number of environmental problems for the environment even at very distant distances from them. It's mostly happening through the transfer of air pollution or groundwater. Pollution of objects of the environment occurs, as a rule, in a complex, because harmful components, affecting the state of one object (air, soil, water, biota), can migrate to others.

For example, some of the pollutants entering the atmosphere in the future will continue to precipitate on the surface of the soil and natural reservoirs and will absorb by the flora and fauna of the surrounding area. The other part of pollutants which entering the soil profile can migrate to groundwater then into natural reservoirs and, likewise, can absorbed by soil and aquatic's flora and fauna [1-3].

The defining criteria for the generation of harmful emissions during the production of livestock products are: species, sex-age group and number of animals; method and duration of keeping animals; the amount of feed fed and their composition for each category of kept animals; the level of digestibility of feeding fodder, which depends on both the nutritional value of the feed itself and the ability to digest the organism of animals; animal productivity and intensity build up economically useful signs; the amount of accumulated waste at the enterprise for the period under study and the presence of unpackaged consumption products in it; method and time of waste storage; external temperature mode.

Therefore, activity of livestock farms, without doubt, impact on the environment. The level and extent of this impact, and the identification of factors that increase or weaken this impact, require careful comprehensive research.

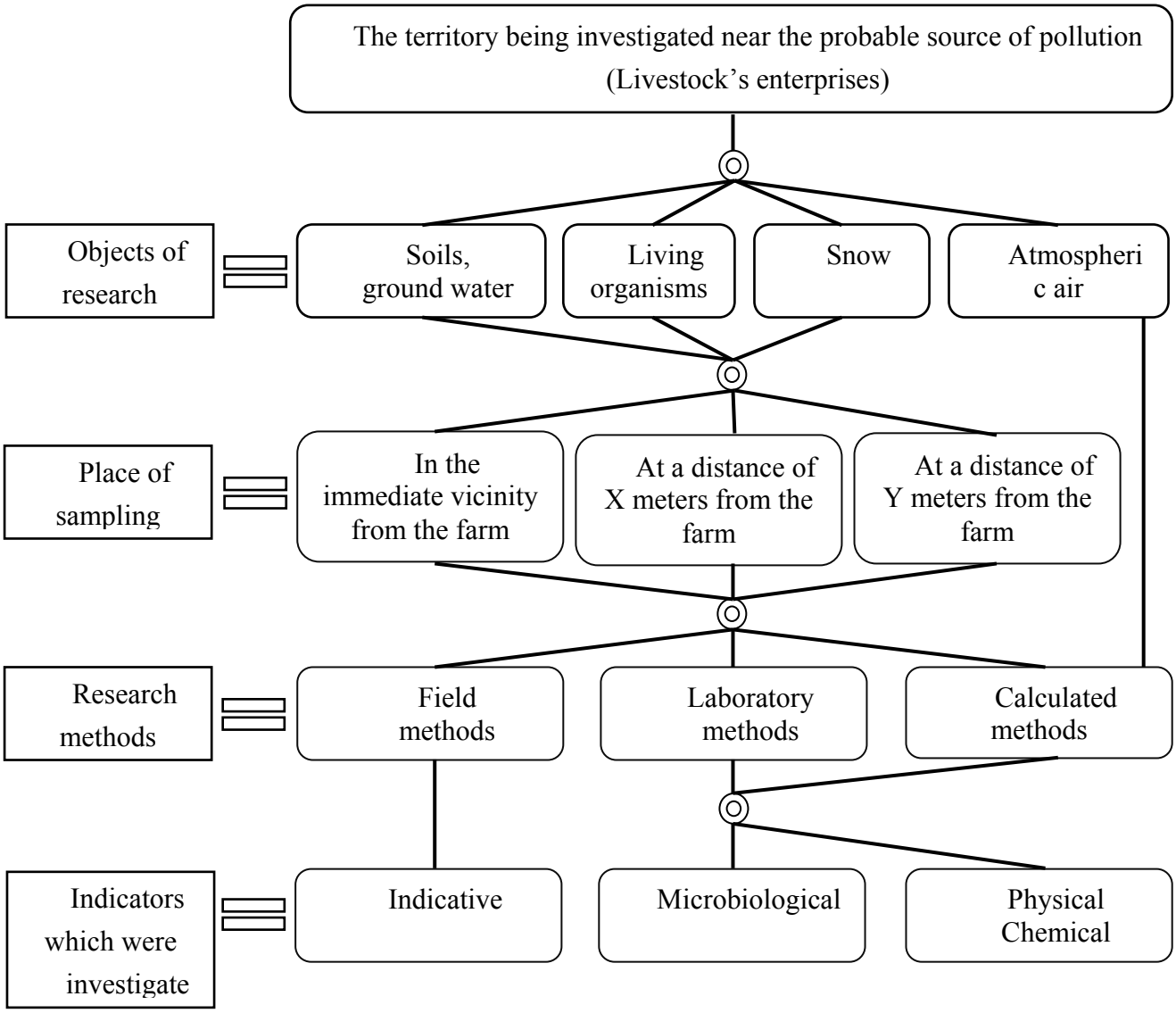
Purpose – develop and propose methodological approaches to complex assessment impact of livestock enterprises on the state of the environment.

Materials and methods. In the process of realization the task, the various methods (calculation, field, laboratory) have been worked out, applied and tested, which made it possible to carry out complex investigations of the objects of the environment on a set of indicators (chemical, microbiological, and bioindicative) in different seasons. Developed and tested their own methods for assessing the state of the environment to which patents was obtained.

Methods was tested in the zone of activity of enterprises with different economic and technological peculiarities of production: pork - SE "EF" Stepne "and SE" EF of the name of the Dekabrystiv " of the Poltava region, LLC" Agrofirma "Medobory" and PAE "Agroprodservice" of the Ternopil region; milk - LLC

"Halychyna", PAE "Dzvin", PE "Ivanivske", PE "AF Medobory", PE "Progress K", PAE "AF Goryn" Ternopil region.

Research results. Summarizing the methodological approaches [4] we used to conduct ecological studies of the environment in the area of livestock enterprises, we can propose such a model for assessing the impact of livestock farms on the environment (drawing).



Model of a comprehensive study of a potentially contaminated area

Among the main pollutants of the atmospheric air are: odorohenni substance, greenhouse gases (PG), dust, microorganisms and endotoxins. Research of the state of the airspace by the means of direct measurements requires special equipment and therefore is rather costly and difficult to realization. Moreover, the concentration of the measured harmful substance in the atmosphere depends on many factors and is constantly changing, including due to weather and climatic conditions at the time of measurement. Therefore for to study the emissions of pollutants into the atmosphere by livestock farms it is expedient to use international calculation methods that allow to calculate theoretically available and predict theoretically possible amount of emissions for individual conditions for each farm and for a certain period of time.

Emissions of pollutants (ammonia, hydrogen sulfide, methane, methanol, phenol, ethyl formiate, propionaldehyde, hexanoic acid, dimethyl sulfide, methanethiol, methylamine, carbon dioxide, microorganisms, dust wool and down) can be calculated according to the methodology foreseen for use values of specific emissions into the atmosphere of pollutants from 1 q live weight of animals (mcg / s / 1 q l. w.) for the balanced feeding of animals. At the same time, account will be taken of intestinal microflora

absorption of carbonyl compounds, carboxylic acids and amines, sorption of amines, mercaptans and hydrogen sulfide, and transformation of mercaptans in dimethyl sulfide, and microorganisms (cells / s / 1 q l. w.), dust of wool and fluff (mcg / s / 1 q l. w.) without taking into account the gravitational deposition of an aerosol [5].

The methodology for calculating GHG emissions proposed by the Intergovernmental Panel on Climate Change (IPCC) focuses on two major GHGs that are produced by livestock farms – methane (CH_4) and nitrous oxide (N_2O). Calculations of GHG emissions from livestock are provided in two main categories: from enteric fermentation and from manure management. However, here it is possible to include also part of the GHG emissions from agricultural land, where animal's manure is introduced as organic fertilizer and from pastures where animal's waste remains during grazing [6].

We have taken into account the maximum number of individual factors that affect on the GHG emissions for each farm and we calculated the emission's coefficients of these gases (per animal) from the investigated farms. That is, GHG emissions are not directly dependent on the number of animals, but significantly depend on the economic and technological characteristics of enterprises.

Planning a study of the state of soils that are affected by the activities of livestock production enterprises should be carried out in accordance to the study tasks. Vectors impact of these enterprises on soils can be very different - in the case of direct introduction of organic waste into the soil through the introduction of them, as organic fertilizers, in particular in excessive quantities; due to improper conditions for their storage and transportation and, as a result, leaching of lethal sewage into the soil from unplanned storage places and direct unauthorized discharges into the soil profile; various emergency situations.

During the research the average livestock enterprises in which no unauthorized direct emissions (emergency situations) of pollutants into the environment were noted, we can assume that the soil cover around livestock farms can accumulate components that enter the environment as a result of their washing out from waste storage sites, or transferred by air at certain distances with subsequent partial settling on it of harmful components (chemical compounds, microorganisms). The estimation of the soil condition in the zone of operation of such enterprises is complicated by the limitation of normalized indicators. Therefore, the level of influence of the activity of the farm on the surrounding soils can estimate by the chemical and microbiological composition of this soil at different distances from the territory of the farm.

During to realization studies near dairy farms and pig farms with different ways of conducting economic activity were identified differences in the list of chemical indicators that change their meanings depending on the remoteness from the source of pollution. That is, at various economic and technological peculiarities of farms, the influence of these farms on the state of the soil is different. Was determined: the content of the moving forms of the main elements of plant nutrition - NPK; components that can characterize the level of organic pollution - total nitrogen, chlorides; heavy metals of the first group of danger - Cd, Cu, Pb, Zn, which can fall into the soil with manure, and the pH.

Monitoring of the content of microelements and heavy metals in soil and fodders is a priority course for control and improvement of feeding rations of farm animals that provide timely prevention of violations of mineral metabolism of their organism. Using the correlation-regression analysis method we have developed and patented mathematical models that provide reliable prediction of the content of heavy metals in feeds, depending on their content in soils: Y=-0,0104+0,5116X (for cadmium); Y=12,6558+18,8237X (for zinc); Y=-14,5953+176,2846X (for copper); where Y - content of heavy metal in feed, mg/kg; X - content of heavy metal in soil, mg/kg.

All farms are installed heterogeneity of the soil composition at different distances from the farm on mobile compounds of nitrogen, copper, zinc, also - the presence of microorganisms. We can assume that these components migrate in the environment by the soil profile or the airspace with a partial settling on the surface of the soil. From the list of determined indicators, the results of the presence of chlorine ions were unchanged at different distances from the farm. Therefore, as regards livestock farms, soil microorganisms can rather regarded as pollutants than biological objects that suffer from the negative effects of farm activity.

Since the presence of microorganisms in the soil depends on many factors, and the soil microbiota is very diverse in terms of species and quantity, the number of individual species can vary significantly in terms of their absolute values. Therefore, it is more correct and informative to compare the total number of identified microorganisms not by their absolute values, but - by relative, using the method proposed by J.

Azzi. The intensity of decrease / increase of a certain relative indicator as far as the distance from the source of contamination (the tendency to decrease / increase, a significant decrease / increase) will characterize the level of influence of this source on the number of available microorganisms [8].

In order to characterize the state of the environment near the objects of pollution it is advisable to use different indicators, which is an alternative to the quantitative measurement of pollutants in certain objects of the environment. For this purpose, as a rule, live organisms are used, their deviations of physiological parameters at different stages of growth and development indicate adverse environmental conditions.

We have developed, tested in the process of research and proposed a method of biotesting the soil using seeds of agricultural crops. It differs from analogues by the fact that it involves a comprehensive account of the physiological and morphological parameters of sprout seed material, which makes it possible to compare and evaluate soil extracts with unknown composition and small differences in their composition [9].

However, the vital functions of biological objects depend heavily on the season, so it is impossible or very difficult to use them in winter. The unique indicator of the environment in the winter period is the snow cover of the studied area, since its formation is occurring precisely at the time of passing drops or crystals of water through certain layers of the atmosphere and absorption of the aerosols there, especially at the surface of the earth. Besides, the snow cover, which for a long time lies directly near the source of pollution, is an ideal sorbent and screen of absorption of harmful substances, which are available in the atmosphere [10, 11].

As an indicator of the presence of available components in the airspace around the pig farm, we used a snow cover surrounding areas. The results of hydrochemical and bacteriological measurements have shown the feasibility of using snow cover in environmental studies on the state of the environment near pig's enterprises. Quantitative and qualitative composition of snow, which was taken at different distances from the territories of investigated farms, had differences in individual components (within one farm) - the level of oxidation, biogenic elements (NH_4^+, NO_3^-), ions of mineral compounds ($Na^+ + K^+$, SO_4^{2-}) and the number of organotrophic bacteria. We assume what exactly these elements and their compounds are not only a compulsory component of the snow, but also are accumulated in it because of anthropogenic influence (pig farms). While in the contents of certain specified ions of mineral compounds (Ca^{2+}, Mg^{2+}, HCO_3^-, Cl^-) no were detected differences depending on the place of sampling. If the mineral composition of the snow is somewhat characterized by the composition of the cloud, from which it fell and depends on the climatic conditions of the studied region then the presence in the snow of organic matter and microorganisms can be linked to the source of pollution near which it lies for some time [12].

Also, the composition of the studied snow can characterize not only the state of the atmosphere, but also the ecosystem in general, since after the melting of snow, all the components in it fall into the soil and groundwater, and then – in natural reservoirs, plants and, possibly, continue their migration by trophic the chain.

Because the quantitative and qualitative composition of the snow does not reflect the exact concentration of the relevant components in any of the objects of the environment, neither in the air nor in the soil or in water, it is considered inappropriate to compare them with known values of maximum permissible concentrations of harmful substances in these environments. That's why we proposed to introduce an indicator that would characterize the conditional load of snow cover that absorbs various components from the air space into the earth's surface after its melting, and call it the "load index" of the snow cover on the ecosystem on which it lays during a certain period.

This indicator allows us to assess the state of the environment at a specific point at a certain distance from the source of pollution, while not taking into account the maximum permissible concentrations of pollutants or background values of the relevant components for a particular territory. It takes into account the individual climatic features of the study area and shows the conditional load of the snow's component on $1m^2$ of the earth's surface. The method is patented [13].

Conclusions

The proposed methodological approaches, alone and in combination, allow conducting an informative comprehensive assessment of environment near livestock enterprises under different economic and technological conditions of this farm and in different weather-climatic periods of the year.

The results of the analysis of the composition of the atmosphere (snow) and the soil in the area of activity of livestock farms provide an opportunity to plan further studies on the migration of pollutants in the trophic chain.

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