SYSTEMIC APPROACH TO LIVESTOCK CONSTRUCTIONS IN THE CONTEXT OF ENVIRONMENTAL PROTECTION

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Abstract

Modern livestock constructions represent a major area of interest in the development of contemporary agriculture, due to their role in supporting animal production, food security and rural development. At the same time, these constructions generate complex interactions with the environment, influencing air, water, soil quality, as well as biodiversity and the balance of local ecosystems.

The current paper presents aspects related to the need for a systemic approach to livestock constructions and the integration of environmental protection requirements into the design process. The main current problems of livestock infrastructure, the relationship between society, environment and livestock farming activities, as well as the importance of defining an area of influence of the livestock holding are highlighted.

It is emphasized that environmental impact assessment must constitute a preventive and integrated tool in technical design, contributing both to reducing negative effects on the environment and to improving constructive and functional solutions.

Key words: *livestock, livestock constructions, environment protection, systemic approach, impact evaluation*

INTRODUCTION

Modern animal husbandry represents one of the essential areas of the agri-food economy, playing a major role in ensuring food security, in the development of rural areas and in capitalization of agricultural resources.

The evolution of this field has required the development of an increasingly complex infrastructure, consisting of animal shelters, storage spaces, manure platforms, feeding and exhaust facilities, ventilation systems and auxiliary buildings [1, 2, 3].

The increasing demands on production, hygiene, biosecurity and animal welfare have transformed livestock buildings into engineering objectives of great importance [4, 5, 6, 7, 8].

At the same time, the development of these construction systems has highlighted the need for careful assessment of the effects they produce on the environment [9, 10, 11, 12, 13].

Under nowadays conditions, livestock buildings can no longer be analyzed exclusively from a structural or functional point of view.

They must be studied as elements that interact with the soil, water, air, flora, fauna, and human communities in the vicinity [14, 15, 16, 17, 18].

In recent decades, technical progress

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and the intensification of agro-zootechnical production have contributed to increasing the availability of animal-based food products.

However, this development has been accompanied by increasing pressure on the environment, manifested by increased resource consumption, polluting emissions, degradation of some ecosystems and reduction of biodiversity [19, 20, 21, 22, 23, 24, 25].

The environment is degradable and limited in resources, and its excessive exploitation can seriously affect the ability of future generations to benefit from the same development conditions.

In this context, husbandry activities must be reconsidered by integrating environmental protection criteria from the conception and design stages [26, 27, 28, 29, 30].

MATERIAL AND METHOD

The paper aims to highlight the theoretical and applied foundations regarding the systemic approach to husbandry constructions and the integration of environmental protection into their design process.

To carry out the study, were analyzed aspects related to:

- the importance of livestock buildings in the context of modern agriculture;
- significant problems of the current livestock infrastructure;
- the relationship between society, the environment and animal husbandry activities;
- the need to define an area of influence of the livestock holding;
- the role of environmental impact assessment as a preventive tool in technical design.

The working method consisted in adapting and restructuring the general concepts regarding the construction-environment relationship to the specifics of husbandry field, aiming to formulate a coherent theoretical framework for the responsible design of infrastructure intended for animal husbandry.

The structure of the analysis took into account the interdisciplinary nature of the field, located at the intersection of construction engineering, environmental sciences, agronomy and animal husbandry.

RESULTS AND DISCUSSIONS

The importance of modern livestock buildings

Modern livestock buildings must simultaneously meet technical, economic, sanitary, ecological and social requirements.

Among the main current concerns are:

- construction of buildings adapted to the physiological and behavioral requirements of animals;
- rehabilitation and modernization of existing agricultural buildings;
- use of materials resistant to humidity, corrosion and aggressive environments;
- reduction of energy consumption and integration of renewable sources;
- control of environmental impact;
- introduction of intelligent monitoring and management systems.

These directions demonstrate that the design of animal husbandry buildings can no longer be limited to strictly constructive criteria, but must be expanded towards an integrated analysis of the relationship between the farm and the environment.

The need for a systemic approach

Current technical problems can no longer be solved efficiently by analyzing the components involved separately.

In the husbandry field, a construction intended for raising animals is not just a housing space, but a complex system in which the resistance structure, technological installations, animals, water and energy

resources, soil, air, flora, fauna and the local community interact.

From this perspective, the livestock farm can be defined as a highly complex system, formed by the relationships between the building, the animals and the environment.

Each change made to one of the components produces effects on the others, which justifies the use of an interdisciplinary and systemic approach.

Area of influence of the livestock farm

A direct consequence of the systemic approach is the need to delimit an area of influence of the livestock farm.

This represents the space in which the direct and indirect effects of the construction and the activities carried out within it are manifested.

The area of influence is not limited to the area occupied by buildings, but includes:

- land occupied by shelters and annexes;
- access roads and technological platforms;
- manure storage and management areas;
- areas exposed to atmospheric emissions and odors;
- surfaces potentially affected by infiltration or leakage;
- areas where flora, fauna or the population may feel the effects of exploitation.

Defining this area is important both for site selection and for the correct assessment of environmental impact and for establishing the necessary protection measures.

Environmental protection as a priority in design

Currently, any project with potential environmental impact must be analysed as an integral part of the "environmental" system.

In animal husbandry, this requirement is all the more important as the location and operation of farms can generate significant changes to soil, water, air and local ecosystems.

Environmental protection must be a priority from the earliest stages of design.

It is not enough for impact reduction measures to be added later, in the form of corrections.

They must be integrated into the initial design of the construction and the operating technology.

The role of environmental impact assessment

Environmental impact assessment should be seen as a preventive measure, not just a formal obligation.

It aims to highlight important impacts, anticipate problems and propose practical solutions to minimize them.

In the case of livestock buildings, the impact assessment must provide useful information for:

• choosing a favourable location;

• adapting constructive and technological solutions;

• protecting environmental factors;

• informing authorities and interested communities;

• assessing the long-term viability of the project.

The impact assessment must evolve simultaneously with the development of the technical project, so as to contribute to the improvement of the constructive and functional solution, not just to the subsequent finding of negative effects.

CONCLUSIONS

Modern livestock buildings must be analysed as complex systems in permanent interaction with the natural and social environment.

Their design can no longer exclusively follow technical and economic criteria, but must explicitly include the requirements of environmental protection, efficient use of resources and integration into the territory.

The systemic approach provides the conceptual framework necessary to understand the relationships between construction, animals and the environment.

In this context, defining a zone of influence of the farm and integrating environmental impact assessment into the design process become essential tools for the development of modern and responsible animal husbandry.

The need for these steps is justified both by current environmental protection requirements and by the economic and social importance of animal husbandry in the sustainable development of rural areas.

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