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DOCTORAL THESIS

RESEARCH ON OPTIMIZATION OF SPECIFIC WORKS AND THE ESTABLISHMENT OF MECHANIZATION AND AUTOMATION TECHNOLOGY GROWTH OF BROILERS AND LAYING HENS IN THE SMALL FARM

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SUMMARY

Motto: "Nothing is more practical than a good theory"

Lord Kelvin

In Romania should pay particular attention to adapting operating systems of poultry rearing and European Union requirements. At the same time, it is necessary to protect and stimulate the growth and operation features of birds competitive advantages of quality products and technologies with minimal environmental impact. A particularly important goal is to promote and implement production systems that are environmentally friendly. This goal is achievable because the agricultural area of Romania is insufficiently exploited. It is important that the technological solutions adopted in the growth and operation of birds to meet all environmental requirements in order to preserve the natural habitat of Romania.

The overriding objective of this paper is to provide a technical solution for economic growth of broilers and laying hens in the farm household. This is particularly necessary because the Romanian peasant does not have the resources to develop business in this area. Also appears necessary to provide a technical and economic solution for sustainable profitable Romanian village. This paper proposes the implementation of optimal technologies for small farmers, environmentally friendly technologies, but the use of existing agricultural and economic resources in the small farm effectively. Research on optimization of specific works and the establishment of mechanization and automation technology growth of broilers and laying hens in the small farm is systematized in two main parts, namely:

Part I - which includes the study of breeding technology, technical parameters of the hybrids of laying hens and meat, and technological equipment used in the growth and operation of birds;

Part II is the size of structure research on poultry housing, poultry equipment location, means of mechanization and automation technology flows and economic calculation modules 300, 900 and 3000 heads, broilers, laying hens, respectively.

To achieve more research was necessary steps are:

1. **Documentation scientifically in order to align with yield in intensive and super-intensive poultry production:** technical and scientific substantiation technologies for production of small household poultry in poultry.

2. **Preparing the experiment:**

• Develop a technical-economic study on the establishment of households in the four micro-poultry farms;

• Develop technologies for exploitation of broilers and laying hens in small farm;

• Develop necessary obtaining recipes combined feed on poultry products from the farms forage resources.

3. Development of technical and material conditions necessary to achieve optimum research:

• Restoration of areas of growth and exploitation of the peasant households, and equipment to conduct specific technological processes of poultry;

• Procurement of feed materials derived from crops produced in the farms;

• Adaptation of the machines for purposes other than poultry.

4. Designing and developing experimental models to achieve research and scientific substantiation for the economic viability of the proposed theme:

• Develop experimental models;

• Acquisition of biological material, formation of the experimental setting and monitoring of key parameters during the production experiment.

5. Determination and quantitative skills qualitative of broilers and laying hens kept in conditions experienced technology:

• Weekly bonuses and final determination, the weekly consumption and specific sustainability and cumulative weekly;

• Statistical analysis and testing the significance of differences.

6. Economic and scientific-technical analysis of the results:

• Analysis of the feed unit cost, per kg body weight;

• Comparative analysis of the results of the experiment, the results achieved at national and global;

• Analysis of investment costs in comparison with investments in technology-intensive and super-intensive system.

7. The technology and growth models:

• Determining the optimal size of a micro-farm broilers or laying hens;

• Establishment of shelters diagram;

• Providing technical solutions to the type, model and equipment costs and facilities used in the growth and operation of broilers and laying hens in the farm household.

8. Proposed models of production:

• Establish a project type of growth and exploitation of permanent nesting hens on free access to paddock system (free range);

• Project technology for farm with a capacity of 3000 broilers.

Part I - covers the study of breeding technology, technical parameters of the hybrids of laying hens and meat, and technological equipment used in the growth and exploitation of birds.

The farming systems, extensive (household), semi-intensive, intensive and super-intensive, organic, were analyzed in terms of advantages and disadvantages. Analyzing the data, we concluded that for the agro-livestock farm system the best growth, technological and economic system is semi-intensive breeding of poultry litter on a permanent basis. Factors that led to this conclusion are: the need for capital to start such an investment, the knowledge must have keeper on the use of poultry equipment, local sales opportunities.

The study and exploitation of technology to increase broiler litter on permanently, semi-intensive system was done in two ways, namely: presentation and analysis of broiler operation depending on growth stages and dates of hybrid technology currently existing and presentation equipment supplied by large poultry companies that are necessary for normal conditions of all processes. The same was done for laying hens for semi-intensive rearing on permanent litter.

In this paper, we made an overview on the technological process to be followed, technical standards for each hybrid hens meat or in part and equipment necessary to conduct the process flow.

In Part II of the research on optimizing specific works and the establishment of mechanization and automation technology growth of broilers and laying hens in the small farm of 300 modules have been analyzed, 900, 3,000 heads of broilers and laying hens .

The study was conducted in several family farms in the county of Iasi, in different locations with limited financial resources, but they want to improve profitability and operating system of laying hens and broilers, in order to obtain additional income to ensure production including the partial sale of free sale, according to current regulations, but with limited material and financial investment.

The research started from a minimum degree of binding measures in households, namely:

• specialized flocks on a particular production, eggs or meat;

• minimum number of 300 heads

• compliance with minimum operating and maintenance technology;

• compliance with minimum requirements for veterinary.

For these types of farms, broilers, was taken into account Directive 2007/43/EC, which sets minimum standards of protection and welfare of chickens kept for meat production (Official Journal L 182, 12.7.2007, p. 0019-0028) is mandatory for intensive farms, with more than 500 chickens for meat production (not for breeding chickens).

Minimum standards of maintenance and operation of laying hens are governed by Rule of 28.11.2001, published in the Official Gazette, Part I no. 113 of 02.12.2002, and Council Directive 1999/74/EC of 19 July 1999 laying down minimum standards for the protection of laying hens. The provisions of these rules do not apply to holdings with fewer than 350 laying hens and breeding farm of the young replacement hens.

The analytical method for calculating the efficiency of livestock forms and models presented in this paper, we analyzed the situation of each household individually, we have seen, identified, and resized household materials that could be adapted to operating systems proposed, based on rules and regulations on the welfare of laying hens and maintenance conditions. Results and economic efficiency calculations were determined using formulas and indices of efficiency in the literature. Herds of 300 head of broilers and laying hens are not required new buildings and existing housing can be used, subject to size and conditions to be met. In the case of populations of 900 and 3,000 broilers and laying hens we need new production hall to meet all the conditions imposed by technology.

Construction livestock, poultry sheds, must meet the following general requirements:

• Satisfaction of conditions imposed by the specific biological process bird populations;

• Establish specific microclimate conditions for growth and operating activities birds (humidity, chemical factors, temperature variations, etc.).

• Strength in time of construction, the possibility of rehabilitation of the profile for which the building was designed;

• Building costs as low.

Poultry sheds are designed to increase the construction and operation of livestock meat or poultry hens. These buildings are designed according to the production surveyed (meat or eggs), technological solution for systems maintenance, system of feeding, watering, manure removal, degree of mechanization and automation of production processes. Analyzing the data presented, are the data for the design of the production halls: spaces for birds, buffer chambers, internal organization of the shelter, microclimate conditions (temperature, humidity, air speed, lighting, etc..), The conditions for feeding, watering, etc.. Geometrical parameters corresponding construction, openings, heights, humidity conditions of closing elements (roof, walls, floor) and executive system of analysis of all characteristics, as outlined above, which must meet the production halls. When developing new poultry breeding farms should be considered a set of

rules to be followed to maintain good health of livestock, to comfort people in the area and not least for the optimal process technology. Because investments in the construction of new shelters for poultry operation, requiring large funds and uptime is high and systematize micro site requires that poultry be devised in view of the neighboring towns and farm development. Such natural conditions offered land to be exploited.

A very important thing to bear in mind is that new poultry breeding farms must fit perfectly into the natural environment and to obtain maximum profit, due to application of clean technology flow and minimal energy consumption.

To manage the optimum one nine poultry holding a series of studies to be carried out very well economically and scientifically documented.

As to the establishment of mechanization and automation technology, research on optimization of specific works and the establishment of mechanization and automation technology growth of broilers and laying hens in small farm were taken into account all factors affecting production and namely:

- light;
- temperature and humidity;
- composition of air pollutants, air currents;
- feeding system;
- watering system;
- nests and resting perches for laying hens
- mechanization of manure disposal.

For farm types presented by new halls will be "blind", without windows, ensuring complete separation of poultry from the external environment, therefore, an independence from natural factors. A prerequisite for the success of this system is the careful design and installation of lighting installation, which should ensure consistency and intensity of light flux at floor level. These things leading up to maximize the productive potential of farm birds. One important thing is that, intensity and color of light can not be standardized in a particular program type, because each hybrid hens meat or needs a proper time and light intensity, otherwise specified by the firms producing biological material. Intensity and duration of flow varies depending on the stage of development of birds.

After analyzing the technical data of the hybrids on the lighting and shelter to the surface, we calculated the total number of light sources, methods of location in space to increase the possibility of automation and electrical schemes to achieve the installation of lighting. In conclusion, we recommend using fluorescent light sources because of their low power consumption and a better uniformity of light output. For automation, we concluded that use

digital timer and arrangement s in their speed, ignition and extinction of light is achieved by imitating the sunset and sunrise. Using this method of fighting and a flash of light remove the stress factor of technology exploitation of birds.

Depending on the number of birds, but the financial possibilities, ensuring the temperature of the production area can be realized:

• only using heating sources that convert electricity into heat;

• Joint heating, electric heat sources and heat plants that convert solid fuels into heat.

After analyzing in detail the technological requirements of the flocks on the thermal regime and the volume of air to be heated shelter, I realized sized heating and wiring diagrams. Automation is accomplished with digital thermostats, temperature sensors placed within the perimeter of the production halls at a distance of 40 cm soil. Study the composition of air pollutants, air flow is essential to optimize the choice of ventilation equipment for livestock and analyzed in this paper. Because the housing of birds appear noxious gas releases CO2, NH3 and H2S is a need for continuous of operation, a minimum flow of fresh air, capable, according to the ventilation system adopted to reduce the amount of gas to the permissible limit. Nourisher used in the farms are considered a semi-automatic, with a storage capacity of about 10 kg feed, filling shall be carried out manually by the caregiver and the distribution is done by gravity during chicken feed consumption by the flocks of birds . Number of feeders was calculated according to the front feeding birds that need the maximum weight. Drinkers are constant level and comprises a pressure tank with a float break to maintain the level. Water reached the level where there watering by dropping a float that maintains constant water level regardless of their consumption by birds. The number of drinking troughs has been calculated according to the required front watering their birds to the maximum weight. Hatcheries are made of wood and provide a nest for six laying hens. Harvesting eggs is carried out manually by human operator. Perches rest are located at the offices of rearing laying hens as technological needs. Following research on the optimization of specific works and the establishment of mechanization and automation technology growth of broilers and laying hens in the small farm we have developed a technology project for the growth and operation of birds, namely: micro-farm model 5000 head capacity hens system, increase in ground litter permanent and free access to the paddock for 3000 model broilers. These include:

• Wiring diagram of the house;

• Schedule timer to simulate sunrise and sunset for fluorescent lamps;

• Specialized lighting circuit for simulating sunset and sunrise with incandescent bulbs;

• Housing - lightweight;

• The heating system;

• Lighting System;

• ventilation system;

• feeding system;

• watering system.

Given that the cost price of the product in poultry, energy costs have a share of 10-20%, it is necessary to optimize consumption and seeking new ways to produce energy at a low price, resulting from this and production decline in the price of poultry products.

In general, lower energy costs to operate in the following ways:

• Optimum sizing of housing;

• Optimum sizing of technological equipment used;

• Thermal insulation of the production halls correct;

• Heat recovery from ventilation air;

• Using electric consumers who have low energy consumption;

• Use mixed heating installations, etc.

Research on optimization of specific works and the establishment of mechanization and automation technology growth of broilers and laying hens in small farm includes a chapter on economic calculations are the ratio between production costs and benefits depending on the modules studied.

In conclusion, growth of broilers and laying hens can be seen as a viable economic business, resulting in minimal effort and expense satisfactory results only met the criteria of growth and exploitation of birds. We recommend these types of holdings, since they require a minimum investment and financial support for those who are interested in developing such a business. Since resources can use existing materials in the household, rational use and exploitation of high grain production in their farm. It requires advanced knowledge of mechanization, automation and computerization of processes but a minimum to ensure high performance technology. These models are holding a peasant household began development which is currently in a decline. By compliance with minimum standards, the products obtained can be traded legally, which means an extra income and higher capitalization of existing feed resources. The first step you need to do, "Farmer" farm is profitable and efficient use of human and material resources. We do not claim that all breeders to become laying hens or broilers but this is a solution for some people in rural areas.