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Environmental Benefits of Extensive Poultry Farming in Serbia

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ABSTRACT

Poultry meat and eggs are in constant high demand and highly ranked products on the world food market. This particularly applies to poultry products obtained through extensive farming in accordance with the principles of organic production. In Serbia, despite its great potential, this type of poultry farming is insufficiently applied. The standards for organic food are very strict and their implementation in poultry farming is demanding. The process of obtaining a certificate of organic products is carried out by authorized certification organizations according to valid national and international legislation. The aim of this article is to point out the ecological benefits of extensive poultry farming in Serbia.

Sırbistan'da Kapsamlı Kümes Hayvancılığının Çevresel Faydaları

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ÖZ

Kanatlı eti ve yumurta, dünya gıda pazarında aranan ve üst sıralarda yer alan ürünlerdir. Bu, özellikle organik üretim ilkelerine uygun olarak kapsamlı çiftçilik yoluyla elde edilen kümes hayvanı ürünleri için geçerlidir. Sırbistan'da, büyük potansiyeline rağmen, bu tür kümes hayvancılığı yetersiz uygulanmaktadır. Organik gıda standartları çok katıdır ve bunların kümes hayvancılığına uygulanması talepkardır. Organik ürünlerin belgelendirme süreci, geçerli ulusal ve uluslararası mevzuata göre yetkili belgelendirme kuruluşları tarafından yürütülmektedir. Bu makalenin amacı, Sırbistan'daki kapsamlı kümes hayvancılığının ekolojik faydalarına dikkat çekmektir.

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1. Introduction

Poultry production is a branch of livestock production, which is of great importance for the economic growth of many countries. Poultry production makes it possible to produce, in a relatively short time, large quantities of high-quality products such as: eggs, meat, then feathers, fertilizer and other products obtained during the slaughtering and processing of carcasses, which increases the profitability of this branch of livestock breeding. Poultry production is very important in order to supply the population with high-quality food items and in this way it solves the population's nutrition

problem to a large extent. The competitiveness and importance of poultry production in our country, and also in some countries around the world, are truly impressive in relation to other branches of livestock production, and in terms of rank, it comes right behind cattle and pig farming. Thanks to the biological characteristics of poultry, it is possible to obtain large quantities of meat and eggs in a very short period of time. Here, we are referring to the high reproductive capacity of poultry, rapid growth, short generation interval, as well as a high degree of food utilization.

To improve growth performance, and the quality of poultry meat and eggs (the production of natural (ecological food, reduction in the costs of the production, and environmental protection), a return to the natural i.e. free (open) production system (free range) is increasingly being advocated. Also, organic plant and livestock production i.e. biopharming is mentioned very often. In this case, all types of poultry would have a significant place, and in the first place, geese, whose production is relatively small in the total number of all types of poultry. In particular, the modern tendencies of the development of self-sustainable agriculture, including self-sustainable poultry farming, especially in the context of the production of natural, ecological-biological food, and the protection of the natural environment, reaffirm the use of different types of poultry, primarily geese and ducks (Mitrović and Đekić, 2013).

This is supported by the fact that chickens are the basis of industrial poultry farming, and in contrast, geese are mostly raised semi-intensively or even extensively. They are not so demanding in terms of growth conditions, especially when it comes to nutrition and housing. Geese are primarily raised for meat, then feathers, fat, quality liver and eggs. Small family farms lead the way in production or they are grown within the homestead. Modern geese farms are rare, not only in our country and surroundings but also in the world (Milošević and Perić, 2011). Geese are mostly raised on private farms, and the keeping system is semi-intensive or semi-extensive, but very rarely intensive.

Many developing countries now recognize the importance of livestock in integrated production systems to provide the sustainable increases in food necessary to feed their rapidly expanding populations. Geese fit well into such systems and are especially well adapted to the humid tropics. They can provide meat and eggs from natural grazing and seem to be more resistant to diseases than other avian species. Yet, even given these advantages, geese have remained a neglected species (Hugo, 1995).

Shi et al. (2008) emphasize that depending on the geographical latitude, there are three groups of geese that are adapted to the given climatic conditions of the respective region, which is why they differ in terms of the duration and time period of the egg production season. For the geese that inhabit temperature zones of higher latitude (400 to 450 latitude) the reproduction season, i.e. the egg-laying period, usually lasts from spring to mid-summer, which is also characteristic of our region. At this period (season), geese reach their maximum reproductive performance. The second group, or type, includes geese that inhabit temperate regions of middle latitude (300 to 400 latitude), whose reproduction season begins in autumn and ends the following spring (or early summer), while the third

type consists of geese that breed in short days, live in subtropical areas (200 to 250 latitude) and breed from late summer to the following spring.

Previous research indicates that climate change is significantly influenced by the breeding of domestic animals. One of the reports of the Food and Agriculture Organization of the United Nations (Food and Agriculture Organization – FAO) indicates that domestic animals produce as much as 18% of harmful greenhouse gases (GHG), which is greater than the amount created by the transport sector. Figures are made using a methodology that takes into account the entire product chain, starting from the cultivation and production of animal feed to the placement of animal products on the market (Marković, 2020).

Climate change decreases the availability of water as an agricultural resource, causes frequent weather disasters, and increases the number of pests. These harms agricultural yields in plant production, but also on the extensive breeding of poultry - especially geese.

Having in mind that geese, compared to other types of poultry, are raised significantly less, it is justified that the literature related to the raising, reproduction and fattening of geese is relatively scarce. In essence, all types of poultry have quite similar physiological, morphological, reproductive and even production characteristics (Milojević, 2019).

Geese are a modest species in terms of breeding conditions and enter breeding relatively late. These birds are characterized by the lowest production of eggs during the season, lower fertility and lower degree of hatchability than any other species of poultry. The productive and reproductive abilities of geese are dependent on genetic and numerous non-genetic factors (Djermanovic et al., 2021).

Waterfowl are the species most suitable to integrated farming systems since they can be used for weed and pest control in many crops as they relish grasses and shun most broad-leaved plants.

Most geese are grazing herbivores and are adapted to exploiting short, high-quality grass swards with relatively low fibre and high digestibility (Fox et al., 2017). Hence, the revolution in grass sward management that has been manifested in the last 50 years has also brought enormous benefits to geese. Grass biomass and quality (especially protein content, although this generally correlates with high-energy digestibility) are easily enhanced by inorganic fertilizer applications which are now a permanent feature of modern agriculture throughout North America and Europe (Fox and Abraham, 2017).

Geese are particularly well suited to such systems. Mature geese are independent, larger than other poultry species and thus less vulnerable to predators. When kept in small flocks and allowed to roam the farmyard or field, they are adept scavengers, requiring less attention than any other domestic bird. Geese adapt easily to captivity, and if small quantities of supplementary feed are provided in the evening they will even return home by themselves. Thus, requiring little extra work, these animals supply nutritious meat, huge eggs and rich fat for cooking, as well as soft down and feathers for bedding and clothing, which makes them particularly appropriate for providing farmers with a supplementary income.

Geese are among the fastest-growing avian species commonly raised for meat. Goose meat is fatter than other poultry meats, but it is well accepted by many local populations (Smith, 1990).

2. Materials and Methods

50 eggs were incubated during every egg production season (February – July; 50 eggs x 6 months = 300 eggs) on a .mini-farm in the Municipality of Bogatic in the Macva region. There were an appropriate number of housing facilities on the farm, where the geese stayed at night and during bad weather conditions. However, the gees spent most of their time in the free space – pasture, which was in abundance. The geese were fed supplementary meal, mainly composed of grains and green mass (Figure 1). The geese were fed hay, which is usually a mixture of Italian ryegrass and white clover, while the silage is from the whole corn plant with the cob. Each year, seasonally egg-laying geese are rarely left to naturally lay on the eggs, because they are incubated and quality and healthy goslings are hatched from them.

Figure 1. Feeding the geese with grains and green mass (Source: photo – Milojević M.)

A total of 300 eggs was used as initial sample material (50 eggs each month during the laying cycle of geese). The eggs were randomly selected, and they were successively incubated during the laying season from February to June.

3. Results

Fertilization of eggs and viability of goslings obtained from the number of laid eggs, that is, fertilized eggs, are shown in Table 1.

Table 1. Fertility and viability of eggs during the laying season in 2021

Indicators	February	March	April	May	June	July	total
Number of incubated eggs	50	50	50	50	50	50	300
Average values of egg mass	178.90	174.55	172.49	168.72	165.39	161.82	170.31
Number of fertile eggs	44	45	47	44	43	42	265
Percent of fertile eggs [%]	88.00	90.00	94.00	88.00	86.00	84.00	88.33
Number of unfertile eggs	6	5	3	6	7	8	35
Percent of unfertile eggs [%]	12.00	10.00	6.00	12.00	14.00	16.00	11.67
Eggs with dead embryos	5	5	3	4	5	6	28
***PJ1 [%]**	10.00	10.00	6.00	8.00	10.00	12.00	9.33
***PJ2 * [%]**	11.36	11.11	6.38	9.09	11.63	14.28	10.64
Gosling hatched	40	43	41	39	38	36	237
***PIG1 [%]**	80.00	86.00	82.00	78.00	76.00	72.00	79.00
***PIG2[%]**	90.91	95.56	87.23	88.64	88.70	85.71	89.40

* Note:
PJ1 -% eggs with dead embryos from incubated eggs
PJ2 - % eggs with dead embryos from fertilized eggs
PIG1- % gosling hatched from incubated eggs
PIG2- % gosling hatched from fertilized eggs

4. Discussion

The data from Table 1 revealed that the eggs from the Italian white goose had solid incubation values, especially in terms of gosling viability, the number of incubated eggs, and the number of fertile eggs.

Egg fertility was lowest at the end of the egg-laying season. Egg fertility was lowest in the warmest month, 84.00% (July), and 90.00% was in April, i.e. 88.33% for the whole season. Information regarding the viability of goslings from the number of eggs laid can be seen in Table 1 i.e. fertility, was the highest in March at 86.00%, and the lowest in June at 72%. While the highest percentage of hatched goslings from the number of fertile eggs was 95.56 in March, the lowest percentage was 85.71% in July. On average, for the whole season of 6 months, the viability was 79.00% of the invested and 89.40% of the fertile eggs.

The data show that the stages of the production cycle influenced the reduction of the average mass of incubated eggs. The largest mass was in the first month (February) of egg production (178.90), and the smallest was at the end of the season, i.e. in the 6th (July) month (161.82). The average weight of all incubated eggs was 170.31.

Out of the total number of eggs incubated, 237 healthy and vital goslings hatched, with the lowest number of goslings hatched in July.

Looking at Table 1, you can see that the eggs incubated in March showed better incubation results, compared to the others, i.e. they had a higher percentage of fertility, also, a higher percentage of goslings laid from the total number of incubated and fertile eggs, and therefore lower embryo mortality during the incubation period.

As support to the above mentioned is the statement of the author Von Luttiz (2000), Shi et al., (2008) who emphasize that the reproductive characteristics of geese, i.e. the productivity and incubation values of eggs, are influenced by the egg-laying season during the year and the geographical latitude where geese exist. All of this is related to the photoperiod as well as the length of the day in the particular region.

Bednarczyk and Rosiński (1999) found that in both strains of Italian white geese (WD1 and WD3), the highest viability of goslings from fertile eggs at the beginning of the egg-laying season was 84.2% (WD1) and 80.00% (WD3), however, gradually decreased until July (60.5% and 56.9% respectively).

Shi et al., (2008) stated that all breeds of geese reared in the natural habitat can be classified, into three types (groups) based on based on their geographical latitude. In these three types of geese, different seasons, i.e. annual changes in photoperiod (length of light day) affect the secretion of gonadotropin and prolactin, and therefore egg production.

Boz et al., (2017) stated that natural incubation compared to artificial incubation resulted in heavier goslings with male goslings being heavier than females. The average weight of a day-old gosling after natural incubation was 94.91g for males, 92.30g for females, and an average of 93.42g for both sexes. However, after artificial incubation, it was observed to be 93.22g for males, 86.36g for females, and an average of 89.93g for both sexes.

When feeding geese, one should have in mind that their digestive tract of geese is capable of digesting cellulose from most plants so that they can be fed a mixture of pasture plants with a slight supplement, which is not the case in the winter feeding period (Labatut, 2002).

To improve the environmental sustainability of livestock systems, including poultry production, the first requirement is to have a systematic tool which can quantify holistically the level of environmental impacts arising from the production, and then identify the potential target areas for environmental improvement (Leinonen and Kyriazakis, 2016).

Extensively raised geese fulfill the requirements of organic livestock production – they have room to move around, spend a certain part of their time outside, and eat food that must be of organic origin. The ecological benefits of farming are reflected in nutritionally richer and better quality eggs and meat (benefit for human health), as well as the preservation of autochthonous species (biodiversity preservation).

Other experimental studies, even if not specifically carried out on chickens, can contribute to increasing knowledge on the possible uses of poultry in association with other agricultural productions; in particular, some trials, carried out with laying hens or geese, highlighted the importance of the interaction of the animal and the environment in the well-being and quality of

products. Different studies (Mugnai et al., 2009; Mugnai et al., 2014; Mancinelli et al., 2018; Massaccesi et al., 2019) examined the effect of husbandry systems (control, organic, and organic plus, consisting of the use of local breeds with 10 m^2 pasture/head) and season on the grass intake and egg quality in laying hens. The results showed that grass intake was largely affected by the husbandry system and highlighted the seasonal effect of grass availability on the nutritional quality of eggs (Dal Bosco et al., 2021).

To encourage producers to extensively breed geese, the government must recognize goose production as a good source of meat and provides subsidies for organic poultry production, especially for the production for geese, since there are no incentives for organic livestock production in the Rulebook. It is necessary to have a certificate issued only by authorized control organizations for easier marketing of products that are treated as organic and ecological. The certificate confirms that the product was produced in accordance with the Law on Organic Production and obtained according to the Rulebook on Control and Certification in Organic Production and Organic Production Methods.

5. Conclusions

Based on findings in this study, it can be concluded that the private (family) farm worked very well, because the incubation rates of the analyzed goose eggs were at a satisfactory level, especially in terms of the viability of goslings out of the number of fertile eggs (about 89.40%). In addition, eggs incubated in February had slightly worse incubation values (fertilization and viability) than eggs incubated in March. This means that incubation values, as well as the characteristics of eggs (especially mass) and hatched goslings, are changeable during the laying season. Because of this, special attention should be given to the extensive system of goose production, to produce as many eggs as possible per goose, i.e. hatched goslings (final product).

Based on the results obtained from this study, it can be concluded that egg weight directly or indirectly affects the quality of hatched goslings. The characteristics of the eggs and hatched goslings are correlated. For this reason, necessary attention should be given to the selected fertile eggs before incubation. This study and other related studies should be a point of reference to produce many eggs per goose as well as to hatch a higher number of high-quality goslings (final product).

The extensive production of geese attracts environmentally conscious consumers, who increasingly use organic products of domestic origin in their nutrition, so extensive production of geese should be given more attention in the poultry industry.

This further underlines the need to strategically manage goose populations around the world to comprehensively take account of the diverse effects of global change, land use, economic, biodiversity and hunting interests as they happen, to safeguard their future well-being.

Statement of Conflict of Interest

The authors have declared no conflict of interest.

Author's Contributions

The contribution of the authors is equal.

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