Local Chicken Breeds and Varieties

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Conservation of local breeds possessing genetic variations specific to the particular environment is essential for sustainable development. Although they exist as numerically small populations, local breeds are not only highly adapted to the natural environment, but are also an integral part of the lifestyle of the rural people. People, livestock and environment form a delicately balanced but sustainable ecosystem, and thus the potential impact of any intervention to improve production in the traditional system should be predetermined. The situation is less sensitive in periurban, industrial and small-scale intensive poultry production, in which rapid improvements can be achieved through well-designed development programmes. The intensive poultry production sector, however, is generally much smaller than the family poultry sector in virtually all developing countries. The present review evaluates twenty years (2001 to 2021) of the study of growth and performance in local chicken breeds worldwide. The assessment of methodological approaches and their constraints when intending to fit for data derived from often endangered autochthonous populations was performed. The evaluation of conditioning factors on the impact that publications reporting on research progresses in the field have on the scientific community and how such advances are valued suggests the need to seek new methodological alternatives or statistical strategies. Such strategies must meet the requirements of local populations which are characterized by reduced censuses, a lack of data structure, highly skewed sex ratios, and a large interbreed and variety variability. The sustainable conservation of these populations cannot be approached if scientific knowledge on their productive behaviour is not reinforced in a manner that allows distinctive products to be put on the market and be competitive.

Keywords: native breeds and varieties ; nonlinear modelling ; growth curves ; poultry

1. Introduction

Chicken breeds make up the majority of all avian breeds in the world (63%). Halfway through February 2021, out of the 875 chicken breeds officially recognised in Europe, 10.64% were extinct and 41.16% were considered to be at risk and included in the “vulnerable” and “critical” classifications according to DAD-IS (Domestic Animal Diversity Information System) FAO database [1]. Moreover, the average number of gaps in ex situ collections of selected crop gene pools and the proportion of local breeds classified as being at risk out of all the breeds whose risk of extinction is known to have been quantifiably developed by the FAO Commission on Genetic Resources for Food and Agriculture in the following sustainable development goals: (2.5.1.) the number of plant and animal genetic resources for food and agriculture secured in either medium or long-term conservation facilities and (2.5.2.) the proportion of local breeds classified as being at risk, not-at-risk or at unknown level of risk of extinction [2]. Only 8.58% of the total European chicken breeds are considered not to be at risk, while for 36.50% of European chicken breeds, not enough information in regard to their status was available, hence they were classified as unknown (**Figure 1**).

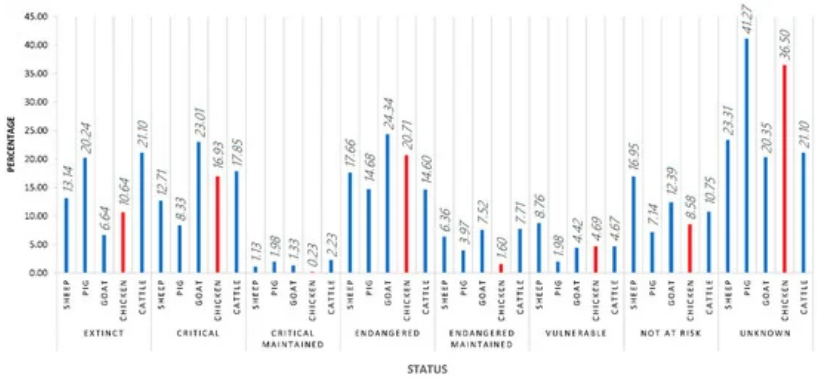

Figure 1. The classification status of European chicken breeds according to FAO DAD-IS halfway through February 2021.

The worldwide number of hens outnumbers the worldwide human population by a ratio of 2.5 to 1. Of the almost 17,000 million birds, approximately half are concentrated in Asia and a quarter in Latin America and the Caribbean. Europe and the Caucasus comprise more than 13% of the worldwide chicken population, followed by Africa with 7%.

As can be inferred from these numbers, indigenous or local breeds represent most of the worldwide poultry genetic diversity. These breeds are classified depending on whether they are registered in a single country (native), in several countries in the same region (regional cross-border), or several regions (international cross-border). The percentages for each of these categories may vary considerably from region to region [3]. As suggested in **Figure 1**, population data are frequently missing (36.50% unknown status), making risk assessment extremely difficult. The lack of data is a consequence of the difficulties that the monitoring of small livestock populations involves as a direct consequence of the weak attention that most governments generally pay to poultry despite their pivotal roles in livestock food security, rural livelihoods, and gender equity [4][5].

The loss of native breeds not only represents a severe threat from the perspective of the disappearance of genetic resources, but also simultaneously translates into the irreversible loss of social, cultural, and inheritance resources. These breeds are an integral part of the evolutionary diversity of each region [6]. Furthermore, it is important to highlight the competitive advantages that the concept of autochthonous breeds indirectly generates for livestock farmers as beneficiaries of the different rural development policies. Breed conservation is the most efficient way to preserve biodiversity [7].

Perhaps the most relevant driving element of this recent drastic loss in poultry genetic resources is the development of productively competitive hybrid strains associated with mergers of breeding companies and the global consolidation of commercial poultry farms [8]. This event has also translated into significant losses in experimental lines, most of which occur in research centres, given the increasing difficulty to find the necessary funds for the conservation of these resources [9].

The need to produce food at the lowest cost has increased the census of highly productive foreign domestic breeds at the cost of displacing native breeds [10]. The process of extinction of breeds not only ends up with the irreparable disappearance of genetic resources but also weakens the populations as a side consequence of genetic erosion as a result of the separated or combined effect of ineffective selection programs on small population sizes [11].

The resilience of local poultry breeds and their ability to thrive in the framework of sustainable systems while the outcomes of production farming practices are maximized ensures the consolidation of these resources [12]. However, it is not their potential as a productive alternative but the possibilities that local breeds offer to obtain differentiated and unique products, whose properties may not only significantly differ from the products obtained through the exploitation of commercial lines, but also which may cover a wider spectrum of consumer needs and thus may target a more specialized market [13].

The enhancement of the commercial opportunities of local products may be one of the most efficient strategies for the conservation of local genotypes and this is the point where the circular economy cycle closes. Product differentiation ensures the satisfaction of particular niches in a rather suitable manner than standardized products, given the ascription of products to the local breeds from which they derive, and the area in which these were produced confers them with an added value which in most of the cases may be supported by a chemical, organoleptic, or even a cultural heritage and traditional basis or a combination of all [13][14].

The proper development of these strategies can only be achieved if products and the animals which produce them are thoroughly known. Local chicken breeds' productive applications could be sorted into three main purposes: meat production, egg production, and aesthetics [13]. According to the report by Shahbandeh [15], the projected global consumption of poultry meat will amount to 151.83 metric kilotons by 2030 from the 133.35 metric kilotons expected for 2021 (carcass weight equivalent), which represents an increase of around 13.86%. This global situation provides evidence of the relevance of meat performance and growth as breeding criteria.

Contextually, growth can be defined as the weight gain of the animal until it reaches adult size. This growth accelerates during the early stages of the individual's life; therefore, there is a greater weight gain when the animal approaches adulthood, so that, when developing the growth curve, there is a line ascending sigmoid curve. As the individual reaches its adult size, the growth rate is altered, and therefore there is a change in curvature. It is at this point (inflection point) where the highest growth rate is identified. From this point on, growth gradually slows down and the growth rate slows down. This is where growth stabilizes, creating a continuous trend, which mathematically coincides with a horizontal asymptote [16]. The growth can be fixed in some coordinates of weight and time employing a series of points, obtaining

growth curves. They can be summarized into several biologically interpretable parameters and provide estimates of growth rate and weight at maturity [17].

Some authors have reported the fact that the smaller the breed, the faster they mature [18]. Indeed, meat production requires birds to be ready to butcher in 4 months weighing more than two pounds live weight. As opposed to local meat chicken breeds, commercially used breeds have been reported to experiment with a sharp and quick growth, while they may not reach the quantity or quality of meat that markets are currently demanding at a rather higher cost which is not maintained if production conditions are not standardized.

2. Growth and Performance in Local Chicken Breeds and Varieties

Although the models by Gompertz and Von Bertalanffy widely cover the scientific scene for growth modelling-related research, a trend in highly impacted indexed journals to explore statistical parametrically simpler but computationally more complex alternatives progressively has occurred. A high sex ratio imbalance may strongly limit the statistical approaches that can be solidly implemented, although the current methods to counteract this situation may not be effective enough (increasing number of females to compensate the lack of male observations). The use of mixed models including breed, variety, or sex as either random or fixed factors has been prevented in favor of nonlinear models given the first may not respond to the distribution properties of the data derived from endangered autochthonous populations. Productive application strongly conditions the better fitting and flexibility performance of models. Growth pattern variability differences between breeds and varieties promotes the fact that a wider scope of models is needed to respond to the existing biological growth patterns. Countries accounting for higher levels of local poultry breed diversity may play a leading scientific role in the dissemination of knowledge related to these local populations and a higher consciousness among breeders, authorities, and research entities may occur.

References

1. FAO. Domestic Animal Diversity Information System (DAD-IS): Data; FAO: Rome, Italy, 2021.
2. FAO. Sustainable Development Goals: Goals; FAO: Rome, Italy, 2021.
3. Hoffmann, I. Livestock genetic diversity and climate change adaptation. In Proceedings of the Livestock and Global Climate Change 2008, Hammamet, Tunisia, 17–20 May 2008; Volume 76.
4. Hu, Y.; Cheng, H.; Tao, S. Environmental and human health challenges of industrial livestock and poultry farming in China and their mitigation. Environ. Int. 2017, 107, 111–130.
5. Moges, F.; Mellesse, A.; Dessie, T. Assessment of village chicken production system and evaluation of the productive and reproductive performance of local chicken ecotype in Bure district, North West Ethiopia. Afr. J. Agric. Res. 2010, 5, 1739–1748.
6. Delgado Bermejo, J.V.; Martínez Martínez, M.A.; Rodríguez Galván, G.; Stemmer, A.; Navas González, F.J.; Camacho Vallejo, M.E. Organization and management of conservation programs and research in domestic animal genetic resources. Diversity 2019, 11, 235.
7. Sponenberg, D.P.; Martin, A.; Couch, C.; Beranger, J. Conservation strategies for local breed biodiversity. Diversity 2019, 11, 177.
8. Gandini, G.; Hiemstra, S.J. Farm animal genetic resources and the COVID-19 pandemic. Anim. Front. 2021, 11, 54.
9. Leroy, G.; Baumung, R.; Notter, D.; Verrier, E.; Wurzinger, M.; Scherf, B. Stakeholder involvement and the management of animal genetic resources across the world. Livest. Sci. 2017, 198, 120–128.
10. González Ariza, A.; Navas González, F.J.; Arando Arbulu, A.; León Jurado, J.M.; Barba Capote, C.J.; Camacho Vallejo, M.E. Non-parametrical canonical analysis of quality-related characteristics of eggs of different varieties of native hens compared to laying lineage. Animals 2019, 9, 153.
11. Alderson, G. Conservation of breeds and maintenance of biodiversity: Justification and methodology for the conservation of Animal Genetic Resources. Arch. Zootec. 2018, 67, 300–309.
12. Taylor, P.S.; Hemsworth, P.H.; Groves, P.J.; Gebhardt-Henrich, S.G.; Rault, J.-L. Ranging behaviour of commercial free-range broiler chickens 1: Factors related to flock variability. Animals 2017, 7, 54.
13. González Ariza, A.; Arando Arbulu, A.; Navas González, F.J.; Ruíz Morales, F.d.A.; León Jurado, J.M.; Barba Capote, C.J.; Camacho Vallejo, M.E. Sensory preference and professional profile affinity definition of endangered native breed eggs compared to commercial laying lineages' eggs. Animals 2019, 9, 920.

14. Narınc, D.; Aksoy, T.; Karaman, E.; Curek, D.I. Analysis of fitting growth models in medium growing chicken raised indoor system. Trends Anim. Vet. Sci. 2010, 1, 12–18.
15. Shahbandeh, M. Projected Poultry Meat Consumption Worldwide from 2021 to 2030. Statista. July 2021. Available online: https://www.statista.com/statistics/739951/poultry-meat-consumption-worldwide/ (accessed on 16 July 2021).
16. Sariyel, V.; Aygun, A.; Keskin, I. Comparison of growth curve models in partridge. Poult. Sci 2017, 96, 1635–1640.
17. Lupi, T.; León, J.; Nogales, S.; Barba, C.; Delgado, J. Genetic parameters of traits associated with the growth curve in Segureña sheep. Animal 2016, 10, 729–735.
18. González Ariza, A.; Nogales Baena, S.; Lupi, T.M.; Arando Arbulu, A.; Navas González, F.J.; León Jurado, J.M.; Delgado Bermejo, J.V.; Camacho Vallejo, M.E. Characterisation of biological growth curves of different varieties of an endangered native hen breed kept under free range conditions. Ital. J. Anim. Sci. 2021, 20, 806–813.

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