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ORGANIC VS. CONVENTIONAL: A COMPARATIVE REVIEW OF HEALTH-RELATED WELFARE ISSUES AND THEIR ECONOMIC IMPACT ON POULTRY PRODUCTION

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Abstract

This review delves into the health-related welfare challenges faced by organic and conventional poultry production, highlighting the impact on bird well-being. It identifies key issues such as disease prevention, behavioural wellness, and environmental quality in both systems, with organic practices facing hurdles like antibiotic-free disease management and conventional systems dealing with antimicrobial resistance and intensive farming pressures. Additionally, the paper explores the economic aspects of these systems, analysing cost structures, market dynamics, and profitability concerns that ultimately affect both producer and consumer choices. This economic perspective is crucial as it interlinks with welfare issues to shape the overall sustainability of poultry farming. The review further advocates for an integrated approach to improve poultry welfare, emphasizing the role of technological innovations like Precision Livestock Farming, policy reforms focusing on animal welfare and sustainability, and the importance of collaboration among stakeholders including producers, policymakers, and consumers. Conclusively, addressing the welfare challenges in poultry production demands a multifaceted strategy that leverages technological advancements, supports policy changes, and fosters stakeholder engagement to enhance animal well-being, meet production goals, and satisfy consumer expectations for ethically produced poultry products.

Key- words**:** *poultry welfare, organic production, conventional farming, technological innovations, stakeholder engagement*

INTRODUCTION

Organic and conventional poultry production systems delineate two divergent systems for poultry rearing, each characterized by distinct attributes and ensuing consequences. The organic paradigm is committed to sustainable agricultural practices, eschews chemical additives, and implements comprehensive oversight throughout the production continuum [29].

Conversely, conventional poultry farming is implicated in several environmental sustainability issues, notably the challenge of antimicrobial resistance [46].

A principal distinction between the two lies in their approach to antibiotic usage. Organic regulations categorically prohibit antibiotic use, a policy aimed at curtailing the proliferation of antimicrobial resistance, a prevalent concern within the ambit of conventional poultry farming [36, 46, 65, 66]. Investigations reveal differential antimicrobial resistance rates across organic and conventional practices, underscoring the influence of production methodologies on this pivotal health issue [46].

Furthermore, organic production systems are lauded for their emphasis on animal health and welfare, environmental guardianship, and the quality of output [5]. These systems privilege ecological integrity and the well-being of animals over purely economic metrics, distinctly setting them apart from their conventional counterparts [5]. The ascendancy of organic poultry farming as a viable sustainable alternative is propelled by a

growing consumer predilection for organic products [23].

From an economic perspective, comparative analyses between organic and conventional broiler production have illuminated the financial dynamics unique to each system [34]. Such understanding is vital for industry stakeholders, enabling informed strategic decision-making and effective allocation of resources. The perception of organic food production and animal welfare by consumers significantly influences purchasing behaviours [40]. Studies suggest a consumer inclination towards organically produced foods, perceived as more natural and cleaner than their conventionally produced counterparts [49, 59]. Market trends reflect an increasing demand for natural and organic food products, necessitating adaptive strategies in poultry production to align with consumer expectations [35, 30, 55, 32]. It is noteworthy, however, that consumer perceptions may not always be congruent with empirical evidence, as exemplified by the higher incidences of *Campylobacter spp.* in organic poultry meat [41].

Regulatory frameworks play an instrumental role in the governance of both organic and conventional poultry farming. Organic systems adhere to stringent standards, such as those outlined by the Swiss organic farming regulation, which delineates the criteria for organic farming practices [42]. In contrast, conventional poultry farming is regulated by a disparate set of standards that address antibiotic usage, food safety, and environmental stewardship [29, 64, 65]. The differential risk perceptions related to public health and food safety hazards between these poultry husbandry systems have a bearing on their societal acceptance [7].

This review aims to offer a comprehensive comparative analysis of organic versus conventional poultry production systems, exploring their respective approaches to antibiotic usage, impact on antimicrobial resistance, emphasis on animal welfare and environmental stewardship, and the economic and consumer dynamics influencing each system. Furthermore, it will delve into the regulatory landscapes governing these practices, providing insights into how these frameworks shape the operational realities of organic and conventional poultry farming.

MATERIALS AND METHODS

Search strategy and selection criteria

1. Databases and search engines used

A comprehensive literature search was performed using PubMed, Web of Science, Scopus, and Google Scholar up to February 2024. These databases were selected for their extensive coverage in agricultural and biomedical research.

2. Search terms and keywords

Searches included keywords related to poultry reared in organic and conventional systems, such as “organic poultry health,” “conventional poultry welfare,” and “antibiotic use in poultry.” Boolean operators were used to refine the searches.

3. Inclusion and exclusion criteria

Scientific articles in English that provided comparative data on health-related welfare issues, sanitary-veterinary practices, economic, social and environmental aspects, in organic and conventional poultry farming. Studies focusing solely on other livestock or lacking comparative analysis were excluded.

Data extraction and synthesis

1. Data extraction

Data were extracted on four main welfare indicators: sanitary conditions, economic factors, social aspects, and environmental impacts.

2. Quality assessment

Study quality was assessed using the Critical Appraisal Skills Programme (CASP) checklist for observational studies, focusing on relevance and methodological integrity.

3. Data Synthesis

A narrative synthesis approach was used due to the varied methodologies in the studies. Results were organized under the identified indicators to facilitate a cohesive comparative analysis between farming systems.

RESULTS AND DISCUSSIONS

Economical perspective

Cost structures and initial investments

Organic poultry farming generally entails higher initial costs compared to conventional methods, primarily due to the requirements for organic certification, specialized feed, and potentially increased labor costs.

These investments in organic practices, while initially more substantial, can lead to significant long-term benefits such as reduced antibiotic usage, enhanced animal welfare, and higher market prices driven by consumer preferences for sustainable products [26, 46].

Conversely, conventional poultry farming typically requires lower initial investments, leveraging conventional production practices that reduce upfront costs but may involve higher ongoing expenses in feed, medication, and infrastructure maintenance [62, 54].

Profitability and market dynamics

Both organic and conventional poultry farming systems face various factors influencing profitability. In organic systems, despite the high initial costs, there is potential for significant profit efficiencies if managed effectively, considering factors like feed costs and sustainable practices such as the use of renewable energy [1, 45, 67, 16].

In contrast, profitability in conventional systems is also dependent on efficient production and market pricing but is more impacted by operational efficiencies and the cost of inputs like feed and healthcare for poultry [1].

Access to extension services and farming experience also play critical roles in achieving profitability in conventional farming [1].

Production efficiency

Production efficiency is critical in both systems for maintaining profitability and competitiveness.

Organic farms must optimize their feed conversion ratios and disease management strategies to compensate for the higher initial costs and maintain market competitiveness [25, 19].

Similarly, conventional farms focus on maximizing output through efficient disease management, genetic selection, and the integration of advanced farming technologies, which help in reducing costs and enhancing productivity [13, 43].

Market preferences and consumer demand

The market for organic poultry is driven by increasing consumer demand for antibiotic-free and ethically produced products, offering opportunities for farmers to capitalize on these niche markets [46, 11].

For conventional poultry, understanding and responding to market demands—such as preferences for fresh vs. processed products—is essential for tailoring production to consumer needs and optimizing market presence [17, 50, 20].

Integrative Economic Perspective

From an economic standpoint, both organic and conventional poultry farming systems offer unique advantages and face distinct challenges.

Organic farming, with its focus on sustainability and premium pricing, appeals to a specific market segment that values ethical and health-conscious products. This can often translate into higher profitability per unit despite the higher initial costs.

Conventional farming, while potentially less costly in terms of initial investment, requires careful management of production efficiency and market strategies to maintain profitability and compete effectively in an increasingly health-aware consumer market.

Ultimately, the choice between organic and conventional farming methods should be informed by a comprehensive understanding of these economic variables and market dynamics, aligned with the specific operational goals and resources of the poultry farmer.

This holistic approach can help ensure sustainable profitability and market competitiveness in the rapidly evolving agricultural landscape.

Table 1 highlights a SWOT analysis both for the organic poultry farming and conventional poultry farming pointing out the differences between the two production systems in terms of strengths, weaknesses, opportunities and threats.

Table 1. SWOT analysis for the conventional and organic poultry production

CATEGORY	ORGANIC POULTRY FARMING	CONVENTIONAL POULTRY FARMING
STRENGTHS	- Enhanced product integrity leading to increased consumer trust - Ability to command premium prices - Sustainable practices due to reduced chemical usage	- Reduced initial financial barriers and rapid scalability - Well-established infrastructure and technological advancements for large-scale production
WEAKNESSES	- Substantial initial investments and delayed return on investment - Regulatory and logistical complexities associated with organic certification	- Reliance on antibiotics and other chemicals potentially leading to health and environmental concerns - Risk of public dissent due to perceived sustainability issues
OPPORTUNITIES	- Growing market demand for organic and ethically produced goods potentially enlarging market share - Niche markets offering premium prices	- Potential cost reductions and enhanced public image through technological innovation in production and disease management
THREATS	- Vulnerability to economic fluctuations affecting consumer spending on higher-priced goods - Intense competition from more cost-effective conventional products	- Increasing consumer preference for organic products might diminish market share - Financial strains due to escalating production costs

Source: Own results.

Health management practices

In comparing disease prevention and treatment practices between organic and conventional poultry systems, several key factors come into play. Organic practices gravitate towards natural and comprehensive methodologies for disease mitigation, conspicuously eschewing the habitual employment of antibiotics in favour of robust management protocols [30]. Conversely, conventional approaches may predominantly harness antimicrobial substances for both therapeutic interventions and disease prophylaxis [22].

Biosecurity protocols emerge as pivotal in curtailing disease propagation across both organic and conventional frameworks. Organic farms, despite potentially grappling with diminished biosecurity measures, and conventional operations alike are necessitated to enact stringent biosecurity measures to thwart the transmission of infectious diseases [24]. The conventional reliance on antibiotics for disease prevention engenders concerns regarding the escalation of antimicrobial resistance and the accrual of veterinary pharmaceutical residues within poultry commodities [4, 2].

Within the organic sector, the exploration of antibiotic alternatives, including the utilization of probiotics and plant-based extracts, reflects a commitment to diminishing antibiotic dependence and fostering sustainable agricultural practices [15, 14]. Nonetheless, the implementation of eficient disease management within alternative poultry production remains fraught with challenges [30].

Economic factors also influence disease management strategies. A comprehensive understanding of the economic burden posed by ailments such as coccidiosis is imperative for the comparative analysis of husbandry practices and the formulation of effective disease mitigation measures [35]. Moreover, the economic ramifications of production diseases within poultry operations underscore the criticality of deploying optimal disease prevention approaches [29, 47].

Nutritional welfare

Nutritional welfare occupies a pivotal role in poultry production, shaping the health and well-being of birds across both organic and conventional systems. In organic farming, the emphasis is placed on a balanced and natural diet, fostering the birds' overall health and aligning with research that seeks to enhance poultry welfare through specific feeding

regimens [28, 61]. Conversely, conventional practices may lean towards optimizing growth and efficiency, occasionally at the expense of nutritional welfare, thereby raising questions regarding feed quality [4].

The dietary composition provided to poultry critically influences not only their health and productivity but also the nutritional quality of the meat and eggs [18, 27, 31]. Studies indicate that alternative farming systems can affect the nutritional makeup of poultry products potentially yielding healthier options characterized by elevated protein levels and reduced fat content [3].

Furthermore, the aspect of animal welfare within poultry farming is intricately connected to diet [63, 8]. Nutrition that is either imbalanced or deficient can adversely impact poultry welfare, manifesting in compromised health and diminished well-being [18]. Adopting strategies to enrich the nutritional profile of poultry feed, such as the inclusion of plant-based additives or probiotics, stands to significantly benefit bird welfare [56, 52].

Consumer perceptions of poultry welfare are also influenced by the nutritional aspects of poultry production. Consumers are increasingly concerned about the quality and safety of poultry products, as well as the welfare of the birds [17]. Meeting consumer expectations for high-quality, nutritious, and ethically produced poultry products requires a holistic approach that considers nutritional welfare alongside animal health and well-being [17].

Environmental enrichment and behavioural well-being

Environmental enrichment emerges as a pivotal component in promoting poultry welfare, exerting a significant impact on natural behaviours, stress reduction, and the general well-being within both organic and conventional farming systems. The incorporation of enrichment materials such as perches, strings, and various stimuli plays a substantial role in modulating poultry behaviour and enhancing welfare outcomes [10, 12]. Studies have elucidated that such environmental enrichments encourage innate behaviours among poultry, including foraging, perching, and dust bathing, which are instrumental in augmenting their welfare [37].

The role of environmental conditions in influencing poultry welfare is paramount across all farming systems. The provision of enrichment resources, such as bales of wood shavings and perches, not only fosters locomotor activity but also promotes species-specific behaviours among broiler chickens, contributing to an uplift in their welfare [21]. Moreover, environmental stress factors like fluctuating temperatures and drafts can interfere with feed consumption and intestinal mobility, thereby impacting digestion and overall health [6].

Beyond augmenting mental and physical health, environmental enrichment bears economic advantages and practical repercussions for poultry production systems [44]. Establishing an enriched environment for poultry can lead to improved biological functioning, diminished stress levels, and a heightened propensity for engaging in natural behaviours [44]. Furthermore, environmental enhancements have been linked with bolstered immune system functionality, highlighting the comprehensive benefits of environmental enrichment in fostering poultry health and welfare [51].

Regulatory frameworks and standards

The distinction between organic and conventional poultry production standards has a significant impact on the health and welfare outcomes for poultry. These differences are primarily shaped by the regulatory frameworks that define each system, significantly influencing the overall well-being of the birds. Organic poultry production is characterized by strict regulations that promote natural and environmentally friendly practices. These regulations mandate conditions such as outdoor access for birds, limitations on the use of antibiotics, and the requirement for organic feed [5]. In contrast, conventional poultry production standards typically prioritize operational efficiency, productivity enhancement, and disease control, often through the use of antibiotics and pharmaceutical interventions [46].

The effect of these regulatory differences on poultry health and welfare is substantial.

Standards in organic poultry production, which focus on animal welfare and encouraging natural behaviours, are associated with improved well-being, lower stress levels, and better overall health for the birds [30]. Such practices as providing environmental enrichment, allowing outdoor access, and feeding organic diets are key factors in achieving better welfare outcomes in organic systems [5]. Meanwhile, conventional production systems may encounter issues related to antimicrobial resistance and disease management, compounded by the stress associated with intensive farming practices [46]. Therefore, the regulatory framework governing poultry production plays a critical role in establishing the standards and practices that influence health and welfare outcomes in both organic and conventional environments.

Consumer perspectives and market trends

Consumer attitudes towards organic and conventional poultry products play a pivotal role in shaping market trends and guiding purchasing behaviours. Research has identified that factors such as perceived health benefits, environmental impact, and concerns regarding product quality and safety significantly influence consumer preferences [48, 53]. Organic poultry products are often favoured for their associated health advantages, commitment to environmental sustainability, and adherence to higher animal welfare standards, resulting in a heightened demand for organic and natural food offerings [35].

The issue of welfare in poultry production, encompassing considerations of animal welfare standards, environmental implications, and antibiotic usage, markedly impacts consumer decisions. Individuals prioritizing animal welfare and environmental sustainability are more inclined to opt for organic poultry options that resonate with their ethical values and beliefs [68]. The perception that organic production systems adhere to superior welfare standards is a significant draw for consumers seeking food products that are both ethically produced and eco-friendly [68].

Moreover, the regulatory disparities between organic and conventional poultry production significantly affect consumer attitudes and choices. Organic regulations, with their focus on animal welfare and the promotion of natural behaviours, appeal to those concerned about animal well-being and environmental preservation. Conversely, conventional practices may be subject to criticism over issues like antimicrobial resistance and the intensity of production methods, influencing consumer perceptions of product quality and safety [58].

The market dynamics for organic and conventional poultry products are thus heavily influenced by consumer attitudes, preferences, and perceptions. With growing consumer consciousness regarding health, sustainability, and animal welfare concerns, there is an increasing demand for organic and ethically produced poultry products. This shift in consumer demand prompts producers and retailers to adapt by expanding their offerings of organic and natural poultry products to accommodate evolving preferences [9, 11].

Challenges and future directions

Both organic and conventional poultry production systems grapple with significant challenges in addressing health-related welfare issues, yet they also stand on the cusp of substantial improvement through the adoption of technological advancements, policy reform, and enhanced stakeholder collaboration. A central hurdle for these systems lies in balancing the imperative of optimal health and welfare for poultry with the pressures of production demands. Organic operations are particularly challenged by elevated production costs and restricted access to pharmaceutical measures, complicating disease management and welfare [38]. Conversely, conventional practices are beset by issues such as antimicrobial resistance, the intensities of production, and environmental sustainability, all of which compromise animal welfare and public health [60].

The horizon of technological innovation offers promising avenues for ameliorating welfare within both organic and conventional frameworks. The deployment of welfare-oriented technologies, including automated monitoring systems, presents the potential to

furnish timely insights into bird health and behaviour. This capability facilitates prompt interventions and fosters enhanced welfare outcomes [57, 33]. Furthermore, the progression of precision farming, selective breeding practices, and nutritional advancements are poised to elevate health and welfare standards across production models [39].

Policy evolution plays an instrumental role in delineating welfare outcomes within poultry production. The establishment of regulatory measures that underscore animal welfare, advocate for environmental preservation, and mandate rigorous disease management protocols can catalyze substantive improvements in both organic and conventional settings [70]. Additionally, the engagement of stakeholders—encompassing producers, policymakers, researchers, and the consumer populace—is imperative for the formulation and execution of efficacious welfare strategies within the poultry sector [69]. Through such collaborative endeavours, poultry production can transcend existing challenges, paving the way for systems that are both productive and humane.

CONCLUSIONS

In conclusion, while each system faces distinct obstacles, ranging from economic constraints and restricted medical interventions in organic practices to antimicrobial resistance and environmental concerns in conventional methods, there exists a clear pathway for improvement. Technological innovations, such as automated monitoring and precision farming, along with genetic and nutritional advancements, emerge as promising solutions to enhance poultry welfare across the board. Moreover, the role of policy reform cannot be understated, as regulatory measures prioritizing animal welfare and environmental sustainability are fundamental to driving positive change. Equally important is the engagement of all stakeholders in the poultry production ecosystem. By fostering collaboration among producers, policymakers, researchers, and consumers, a more holistic approach to poultry welfare can be achieved, ensuring the well-being of poultry while also meeting production demands. Through these concerted efforts, the poultry industry can navigate the challenges it faces today, moving towards a future where both animal welfare and production efficiency are upheld.

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