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Organic poultry production: Principles, practices and future prospects

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Abstract

Organic poultry production has emerged as an important component of sustainable agriculture due to increasing consumer demand for safe, nutritious and environmentally friendly poultry products. Unlike conventional poultry farming, organic systems emphasize natural feeding, outdoor access, lower stocking density, animal welfare and avoidance of synthetic chemicals, antibiotics and genetically modified feed ingredients. These practices support ecological balance, biodiversity conservation and improved soil fertility through nutrient recycling and sustainable waste management. Organic poultry products are often perceived as healthier because they may contain lower chemical residues and higher levels of beneficial nutrients such as omega-3 fatty acids and antioxidants. Different organic production systems, including free-range, pasture-based, semi-intensive and backyard systems, contribute to sustainable poultry farming under various environmental and economic conditions. Proper housing, nutrition, vaccination, biosecurity and alternative therapies such as probiotics and herbal additives are important for maintaining bird health and productivity. However, organic poultry farming faces several challenges, including high feed costs, disease risks, lower productivity, certification difficulties and limited market infrastructure. Despite these constraints, increasing awareness regarding food safety, environmental sustainability, antimicrobial resistance and animal welfare continues to drive market growth. Technological innovations, alternative feed resources and supportive government policies are expected to improve the future sustainability and profitability of organic poultry production worldwide.

Keywords: Animal welfare, Environmental sustainability, Organic certification, Organic feed, Organic poultry farming

1. Introduction

Poultry farming is one of the fastest-growing sectors of animal agriculture and plays an essential role in meeting the increasing global demand for animal protein. Poultry meat and eggs are widely consumed because they are relatively affordable, nutritious and acceptable across different cultures and religions. Over the past few decades, intensive poultry production systems have expanded rapidly due to urbanization, population growth and improvements in breeding, nutrition and management practices (FAO, 2021). Although conventional poultry farming has significantly increased productivity, concerns regarding food safety, environmental pollution, animal welfare and excessive use of antibiotics have become major issues worldwide. In recent years, consumers have become more conscious about the quality and safety of food products. As a result, there has been growing interest in organic farming systems, including organic poultry production. Organic poultry farming is considered an alternative and sustainable approach that focuses on natural production methods, ecological balance, animal welfare and reduced use of synthetic chemicals. According to the International Federation of Organic Agriculture Movements (IFOAM, 2014), organic agriculture is a production system that sustains the health of soils, ecosystems, animals and people through ecological processes and biodiversity conservation. Organic poultry production differs from conventional poultry farming in several aspects. Organic systems emphasize the use of organic feed ingredients, outdoor access, lower stocking density, natural growth and prohibition of synthetic growth promoters and routine antibiotics (USDA, 2022).

Birds are allowed to express natural behaviours such as scratching, pecking, dust bathing and foraging, which are often restricted in intensive confinement systems. These practices are believed to improve animal welfare and reduce stress among birds (Fanatico, 2008) ^[25]. The increasing demand for organic poultry products is mainly driven by consumer perception that organic meat and eggs are healthier, safer and environmentally friendly. Organic poultry products may contain lower pesticide residues and improved fatty acid composition compared with conventionally produced products (Castellini *et al.*, 2012) ^[15]. Consumers are also willing to pay premium prices for products produced under ethical and environmentally sustainable conditions. Consequently, the organic poultry market has expanded significantly in Europe, North America and several developing countries. Despite the advantages associated with organic poultry farming, the system also faces many challenges. Organic feed ingredients are expensive and not always readily available. Disease prevention is more difficult in outdoor production systems because birds are exposed to environmental pathogens, parasites and climatic stress (Rahmann, 2007) ^[69]. In addition, organic poultry production generally has lower growth rates and feed efficiency than intensive commercial systems. Certification procedures, record keeping and compliance with organic standards may also increase production costs for farmers. In developing countries such as India, organic poultry farming has considerable potential because many rural poultry production systems are already based on traditional low-input practices. Indigenous poultry breeds commonly raised in villages possess better adaptability, disease resistance and scavenging ability than highly specialized commercial breeds. Therefore, organic poultry farming can provide opportunities for improving rural livelihoods, nutritional security, women empowerment and sustainable agriculture. Environmental sustainability is another important aspect of organic poultry production. Organic farming practices encourage biodiversity conservation, nutrient recycling, reduced chemical pollution and better soil fertility management (Lampkin, 2011) ^[52]. Compared with conventional systems, organic poultry farming generally relies less on synthetic inputs and promotes ecological balance. However, some researchers argue that lower productivity in organic systems may increase land use requirements per unit of production. Therefore, continuous research and technological innovation are necessary to improve the efficiency and sustainability of organic poultry systems.

2. Historical Development of Organic Poultry Production

Organic agriculture emerged during the early twentieth century as a response to the negative effects of industrialized agriculture, particularly soil degradation, excessive dependence on chemical fertilizers and declining ecological sustainability. Early advocates of organic farming, including Sir Albert Howard, Rudolf Steiner and Lady Eve Balfour, emphasized the importance of maintaining soil health, ecological balance and natural biological processes in agricultural systems (Howard, 1940; Steiner, 1924; Balfour, 1943) ^[41, 78, 4]. In the initial stages, organic farming primarily concentrated on crop cultivation and soil fertility management. Over time, livestock integration became an essential component of organic agriculture because animals contribute significantly to nutrient recycling, farm diversification and ecological stability. Poultry production was gradually incorporated into organic systems due to the

beneficial role of birds in pest control, manure production and sustainable farm management (Lampkin, 1990) ^[50]. The expansion of organic poultry farming accelerated during the 1970s and 1980s, especially in Europe and North America, as consumers became increasingly concerned about environmental pollution, food safety, animal welfare and the extensive use of antibiotics and synthetic chemicals in conventional livestock production systems (Sundrum, 2001) ^[79]. During this period, governments and international agencies introduced regulations and certification systems to standardize organic farming practices and ensure product authenticity. At present, organic poultry production has expanded considerably across many regions of the world, including Europe, North America, Asia and Latin America. The growing consumer demand for environmentally sustainable, welfare-oriented and chemical-free poultry products continues to drive the development of the organic poultry sector globally (Windhorst, 2005) ^[88].

3. Definition and concept of organic poultry production

Organic farming is a sustainable agricultural system that promotes ecological balance, biodiversity conservation, soil fertility and environmental protection while avoiding the use of synthetic fertilizers, pesticides, antibiotics and genetically modified organisms (FAO, 2001). It relies on natural biological processes, renewable resources, and environmentally friendly practices to maintain the health of soil, plants, animals, humans and ecosystems.

According to the Food and Agriculture Organization, organic agriculture is a holistic management system that enhances agroecosystem health, biodiversity, biological cycles and soil biological activity (FAO, 2003). Similarly, the International Federation of Organic Agriculture Movements defines organic farming as a production system that sustains the health of soils, ecosystems and people through ecological processes and biodiversity adapted to local conditions rather than harmful external inputs (IFOAM, 2008).

Organic farming integrates traditional agricultural knowledge with modern scientific approaches to develop productive, economically viable and environmentally sustainable systems (Lampkin, 1997) ^[51]. Important practices include crop rotation, biological pest control, nutrient recycling, mixed farming and natural disease prevention. In organic poultry production, emphasis is placed on natural feeding, outdoor access, lower stocking density and improved animal welfare compared with conventional intensive systems.

4. Importance of Organic Poultry Production

Organic poultry production has become increasingly important worldwide because of growing consumer concerns about food safety, environmental sustainability and animal welfare. Demand for organic poultry meat and eggs has risen significantly, especially in countries such as United States, Germany, France and United Kingdom (Willer and Lernoud, 2021) ^[87]. Consumers increasingly prefer organic products because they are produced without routine antibiotics, synthetic growth promoters or genetically modified feed ingredients (USDA, 2023). Organic poultry farming also contributes to environmental sustainability by improving soil fertility, encouraging biodiversity conservation, reducing chemical pollution and supporting nutrient recycling (FAO, 2001). Poultry manure is commonly recycled as organic fertilizer, reducing dependence on synthetic fertilizers and minimizing contamination of soil and water resources (Reganold and Wachter, 2016) ^[70]. Organic systems further

support ecological balance by promoting natural vegetation and beneficial microorganisms. Animal welfare is another major advantage of organic poultry production. Organic standards require outdoor access, natural lighting, lower stocking densities and opportunities for birds to express natural behaviors such as foraging, scratching, and dust bathing (Van de Weerd *et al.*, 2009) ^[86]. These practices can reduce stress and improve bird health and welfare. However, outdoor systems may also expose birds to predators, parasites and adverse climatic conditions, making proper management essential.

5. Principles of Organic Poultry Production

Organic poultry production is based on a holistic farming approach that promotes environmental sustainability, animal welfare, human health and ethical management practices. Unlike conventional poultry systems that mainly focus on maximizing productivity, organic farming emphasizes harmony between agricultural practices and natural ecosystems. The four core principles established by the International Federation of Organic Agriculture Movements health, ecology, fairness and care form the foundation of organic poultry production systems (IFOAM, 2005).

5.1 Principle of Health: The principle of health emphasizes maintaining the well-being of soil, plants, animals, humans, and the environment as an interconnected system. In organic poultry farming, bird health is supported through preventive management practices such as balanced organic nutrition, proper ventilation, low stocking density, sanitation and outdoor access (Sundrum, 2001) ^[79]. The routine use of antibiotics, synthetic growth promoters and chemical feed additives is avoided. Instead, farmers rely on biosecurity, vaccination, probiotics, herbal remedies and good husbandry practices to strengthen natural immunity and reduce disease incidence (Fanatico *et al.*, 2009) ^[26]. This approach also minimizes antimicrobial resistance and chemical residues in poultry products while promoting safer food and healthier ecosystems.

5.2 Principle of Ecology: The ecological principle focuses on maintaining balance with natural ecosystems and biological cycles. Organic poultry systems encourage nutrient recycling, where poultry manure is used as organic fertilizer to improve soil fertility and crop productivity (Lampkin, 1990) ^[50]. Birds are provided outdoor access and pasture areas that allow natural foraging behavior, contributing to both welfare and ecological sustainability. Practices such as rotational grazing and integrated farming help reduce soil degradation, nutrient accumulation and disease buildup (Rahmann, 2007) ^[69]. Organic farming also discourages the use of synthetic fertilizers, pesticides, genetically modified organisms, and other harmful chemicals, thereby protecting biodiversity, soil health and water quality.

5.3 Principle of Fairness: The principle of fairness promotes ethical and socially responsible relationships among farmers, animals, consumers, workers and the environment (IFOAM, 2005). Animal welfare is a major concern in organic poultry production, where birds are reared under conditions that allow natural behaviors such as scratching, dust bathing, perching and foraging. Organic standards generally require lower stocking densities and outdoor access to reduce stress and improve comfort (Castellini *et al.*, 2008) ^[14]. Fairness also extends to consumers through transparent production systems,

certification standards and the supply of safe, high-quality poultry products produced under humane conditions.

5.4 Principle of Care: The principle of care emphasizes precautionary and responsible management practices to protect animal health, environmental quality and human well-being (IFOAM, 2005). Organic poultry farming avoids excessive dependence on synthetic chemicals and risky technologies with uncertain long-term impacts. Preventive health care strategies, including proper sanitation, balanced feeding, biosecurity, vaccination and stress reduction are prioritized to maintain flock health (Sundrum, 2001) ^[79]. Environmental care is also emphasized through sustainable manure management, composting, responsible resource use and pasture rotation to minimize pollution and conserve biodiversity.

6. Characteristics of Organic Poultry Production

Organic poultry production is distinguished from conventional poultry farming by a set of management practices and production standards that prioritize environmental sustainability, animal welfare, food safety and natural resource conservation. These systems are designed to create a balanced relationship between poultry birds, the environment, and human health. Organic poultry farming emphasizes natural growth, preventive healthcare, ecological balance and ethical treatment of animals while minimizing dependence on synthetic chemicals and industrial inputs (IFOAM, 2005).

7. Types of Organic Poultry Production Systems

Organic poultry production systems differ according to management intensity, climatic conditions, resource availability, market demand and land accessibility. These systems are specifically designed to ensure ecological sustainability, bird welfare, food safety and economic efficiency while complying with organic certification standards (IFOAM, 2005; USDA, 2019). In contrast to intensive conventional poultry farming, organic systems emphasize outdoor access, natural feeding behavior, reduced stocking density and environmentally responsible management practices (Sundrum, 2001) ^[79]. Depending on production objectives and local farming conditions, organic poultry farming may be practiced under free-range, pasture-based, semi-intensive or backyard production systems.

7.1 Free-Range Organic System: The free-range organic poultry system allows birds regular outdoor access where they can perform natural behaviors such as scratching, pecking, dust bathing, and foraging (Appleby *et al.*, 2004) ^[2]. Birds are generally housed indoors during adverse weather or at night for protection. This system improves animal welfare, reduces stress and aggressive behavior, and enhances skeletal and immune health due to sunlight exposure and exercise (Castellini *et al.*, 2008; Van de Weerd *et al.*, 2009) ^[14, 86]. Free-range birds may produce meat and eggs with better flavor, darker yolks and higher omega-3 fatty acids because of natural forage intake (Ponte *et al.*, 2008) ^[67]. However, the system faces challenges such as predation, disease exposure, climatic stress, larger land requirements and lower production efficiency (Sundrum, 2001) ^[79].

7.2 Pasture-Based Organic System: Pasture-based organic poultry systems depend heavily on grazing and natural vegetation as part of bird nutrition (Lampkin, 1990; Rahmann,

2007)^[50, 69]. Birds consume grasses, insects, worms and seeds along with organic feed supplements. These systems support soil fertility and nutrient recycling because poultry manure acts as a natural fertilizer (Francis *et al.*, 2003)^[35]. Rotational grazing helps maintain pasture quality and reduce parasite buildup. Products from pasture-raised birds often contain higher omega-3 fatty acids and antioxidants, improving nutritional quality (Dal Bosco *et al.*, 2012)^[17]. Although environmentally sustainable, these systems require careful pasture management and involve higher labour requirements and slower growth rates.

7.3 Semi-Intensive Organic System: The semi-intensive organic system combines indoor housing with limited outdoor access (Sundrum, 2001)^[79]. Birds receive protection from predators and harsh weather while still being able to exercise and express some natural behaviors. This system offers better control over feeding, hygiene, vaccination and biosecurity compared to fully extensive systems (Castellini *et al.*, 2008)^[14]. Semi-intensive systems generally achieve improved feed efficiency and productivity while maintaining acceptable welfare standards. However, poor management can lead to ventilation problems, wet litter, ammonia accumulation and disease outbreaks (Dawkins *et al.*, 2004)^[18].

7.4 Backyard Organic Poultry System: Backyard organic poultry farming is a low-input traditional system commonly practiced in rural areas (FAO, 2013; Miao *et al.*, 2005)^[57]. Birds scavenge freely and feed on insects, kitchen waste, grains, and natural vegetation. Indigenous breeds such as Aseel and Kadaknath are preferred because of their adaptability and disease resistance (Padhi, 2016)^[62]. Backyard poultry contributes to household nutrition, income generation, and women empowerment. It also helps conserve native poultry genetic resources. However, poor healthcare, inadequate nutrition, weak biosecurity and predation often reduce productivity and increase mortality (Permin & Pedersen, 2002)^[65].

8. Breeds Suitable for Organic Poultry Production

Selection of suitable breeds is essential for successful organic poultry farming because birds must adapt to outdoor environments, natural foraging and lower-input management systems (Fanatico *et al.*, 2008)^[25]. Unlike fast-growing commercial strains, organic systems prefer slow-growing, hardy and dual-purpose breeds that show better disease resistance, adaptability and welfare performance (Castellini *et al.*, 2002)^[12].

8.1 Characteristics of Suitable Breeds

Breeds used in organic poultry production should possess traits such as disease resistance, adaptability to climatic stress, strong immune response, good foraging ability, moderate growth rate and heat tolerance (Sundrum, 2001)^[78]. Birds with efficient scavenging ability can obtain part of their nutrition from natural resources, reducing feed costs and improving sustainability (Miao *et al.*, 2005)^[57]. Moderate-growing birds are generally healthier and more active than fast-growing commercial broilers, which are prone to leg disorders and metabolic diseases (Bokkers & Koene, 2003)^[9].

8.2 Indigenous and Suitable Breeds: Indigenous breeds are highly suitable for organic farming because they are naturally adapted to local environmental conditions and possess better resistance to diseases and climatic stress (Padhi, 2016)^[62].

Aseel is valued for its hardiness, disease resistance and meat quality, although it has slower growth and lower egg production. Kadaknath is popular for its black meat, medicinal value and adaptability to free-range conditions (Haunshi *et al.*, 2011)^[38]. Vanaraja is widely used in rural and semi-intensive organic systems because of its good growth, egg production and scavenging ability. Rhode Island Red performs well in free-range systems due to its adaptability and egg-laying capacity. Naked Neck is preferred in tropical regions because its reduced feather cover improves heat tolerance and productivity (Horst, 1989)^[40].

8.3 Slow-Growing Broiler Strains: Slow-growing broiler strains are preferred in organic poultry systems because they show better mobility, stronger skeletal structure and improved welfare under outdoor conditions (Fanatico *et al.*, 2008)^[25]. These birds actively engage in natural behaviors such as foraging and scratching, resulting in healthier growth and better adaptability. Meat from slow-growing birds is also preferred for its firmer texture, superior flavor and improved carcass quality (Castellini *et al.*, 2002)^[12].

9. Organic Certification Standards

Organic poultry production is regulated through international and national certification standards that ensure environmental sustainability, animal welfare, food safety, and consumer confidence. These standards govern housing, feeding, healthcare, processing and labeling practices in organic poultry systems. Major organizations such as the United States Department of Agriculture, European Union, Codex Alimentarius Commission, and International Federation of Organic Agriculture Movements have established guidelines for organic livestock production (IFOAM, 2014; USDA, 2023).

9.1 International Standards

The USDA Organic Standards operate under the National Organic Program (NOP), which requires poultry to be raised organically from the second day of life onward (USDA, 2023). Birds must receive 100% certified organic feed free from genetically modified organisms (GMOs), antibiotics and synthetic growth promoters. Outdoor access and opportunities for natural behaviors such as foraging and dust bathing are also mandatory (Greene *et al.*, 2009)^[37].

The European Union Organic Regulation (EU Regulation 2018/848) strongly emphasizes biodiversity conservation, sustainability and animal welfare (European Commission, 2022)^[24]. EU standards require lower stocking densities, outdoor access and restrictions on synthetic substances in feed and healthcare management. The system also promotes strict traceability and inspection procedures to improve transparency in organic food supply chains. The Codex Alimentarius Guidelines developed by the Food and Agriculture Organization and the World Health Organization provide internationally accepted principles for organic food production and labeling (FAO/WHO, 2007). Although not legally binding, these guidelines help harmonize global organic trade standards. IFOAM standards further provide the ethical and philosophical foundation of organic agriculture worldwide.

9.2 National Standards

In India, organic certification is regulated through the National Programme for Organic Production (NPOP), implemented by the Agricultural and Processed Food

Products Export Development Authority (APEDA, 2022). NPOP includes standards for feed management, animal welfare, disease prevention and certification procedures. In the United Kingdom, organic poultry production follows standards aligned with EU regulations, while organizations such as the Soil Association impose additional welfare requirements, including stricter stocking density and outdoor access rules (Soil Association, 2021) ^[76]. Australia regulates organic production through certification systems such as Australian Certified Organic (ACO), focusing on biodiversity conservation, ecological sustainability and prohibition of synthetic chemicals (DAFF, 2021).

9.3 Requirements for Organic Poultry Farms: Organic poultry farms must comply with strict standards related to land management, housing, feeding, healthcare and record keeping. Land used for organic production must remain free from prohibited synthetic chemicals for a specified conversion period before certification is granted (USDA, 2023). Soil fertility is maintained through crop rotation, composting and organic waste recycling (Lampkin, 1997) ^[51]. Housing systems should provide adequate floor space, ventilation, natural light, nesting areas and perches to support bird welfare. Outdoor access is compulsory in most certification systems, enabling birds to perform natural behaviors such as scratching, foraging and dust bathing (Castellini *et al.*, 2008) ^[14]. Organic poultry must be fed certified organic feed free from GMOs, antibiotics, and prohibited additives. Feed commonly includes cereals, legumes, oilseed cakes, green fodder, probiotics and herbal supplements (Jacob and Pescatore, 2017) ^[47]. Farmers are also required to maintain detailed records related to feed sources, health management, vaccination, mortality and product sales to ensure traceability and transparency (European Commission, 2022) ^[24].

9.4 Conversion Period: The conversion period refers to the transition phase during which conventional farms adopt organic practices before certification can be granted. During this period, farms must follow organic regulations even though products cannot yet be marketed as organic (Lampkin, 1997) ^[51]. In most systems, land must remain free from prohibited synthetic substances for approximately three years (USDA, 2023). Certification agencies evaluate compliance through farm inspections, management plans, feed records and healthcare documentation (APEDA, 2022). Annual inspections and surprise visits are conducted to maintain certification integrity and consumer trust.

9.5 Labeling and Marketing Regulations: Organic labeling regulations protect consumers from misleading claims and ensure product authenticity. Under USDA regulations, products labeled “organic” must contain at least 95% certified organic ingredients, while products labeled “made with organic ingredients” must contain at least 70% organic content (USDA, 2023). Traceability systems are essential in organic poultry supply chains to verify compliance from farm to retail market (European Commission, 2022) ^[24]. Advanced technologies such as blockchain are increasingly being explored to improve transparency and reduce certification fraud (Galvez *et al.*, 2018) ^[36]. Consumer demand for organic poultry products continues to increase because such products are often perceived as healthier, safer and environmentally friendly (Hughner *et al.*, 2007) ^[42]. However, concerns related to certification fraud, inconsistent regulations, and lack of

transparency may still affect consumer confidence (Yiridoe *et al.*, 2005) ^[90].

10. Housing Management in Organic Poultry Production

Housing management is essential in organic poultry production because it affects bird welfare, health, productivity and environmental sustainability. Organic housing systems are designed to provide a natural and comfortable environment while protecting birds from stress, diseases and harsh weather conditions (Sundrum, 2001) ^[79]. Proper housing improves immunity, hygiene, feed efficiency and overall flock performance (Appleby *et al.*, 2004) ^[2].

10.1 Objectives of Organic Housing: The main objective of organic poultry housing is to ensure bird comfort and welfare while supporting sustainable production. Housing should protect birds from predators, extreme temperatures, rain and wind while allowing natural behaviors such as scratching, perching, dust bathing, and wing flapping (Bestman & Wagenaar, 2003) ^[7]. Adequate ventilation is important to remove excess moisture and harmful gases like ammonia, reducing respiratory diseases and improving air quality (Miles *et al.*, 2004) ^[58]. Natural lighting is also encouraged to support normal biological rhythms and bird activity (Appleby *et al.*, 2004) ^[2].

10.2 Housing Requirement: Organic poultry standards require regular outdoor access so birds can forage and exercise naturally (European Commission, 2018) ^[23]. Poultry houses should include perches, nest boxes, and good-quality litter to improve comfort and reduce stress-related behaviors (Olsson & Keeling, 2000) ^[61]. Adequate floor space is necessary to avoid overcrowding, improve ventilation and reduce disease transmission (Dawkins *et al.*, 2004) ^[18]. Litter materials such as rice husk, straw, wood shavings and sand help absorb moisture and support natural behaviors (Shepherd & Fairchild, 2010) ^[74].

10.3 Ventilation: Ventilation is critical in maintaining suitable temperature, humidity and air quality inside poultry houses. Proper airflow removes excess moisture and harmful gases such as ammonia produced from manure decomposition (Kristensen & Wathes, 2000) ^[48]. Poor ventilation can lead to wet litter, respiratory diseases, coccidiosis and reduced productivity (Shepherd & Fairchild, 2010) ^[74]. Organic systems commonly use natural ventilation through windows, roof vents and side curtains because it is energy-efficient and environmentally friendly (Sundrum, 2001) ^[79].

10.4 Lighting: Lighting management influences poultry growth, reproduction, behavior, and welfare. Organic systems mainly rely on natural daylight to maintain normal feeding activity and circadian rhythms (Lewis & Morris, 2000) ^[54]. Artificial lighting may be used when daylight is insufficient, but excessive lighting should be avoided because it may increase aggression, feather pecking and stress (Deep *et al.*, 2010) ^[20]. Organic standards also recommend a dark period for proper rest and recovery.

10.5 Litter Management: Litter management is important for maintaining hygiene, comfort and disease control in poultry houses. Materials such as rice husk, straw, sawdust, and sand are commonly used because they absorb moisture and provide insulation (Bilgili *et al.*, 2009) ^[8]. Wet or poorly managed litter promotes bacterial growth, ammonia production and

diseases such as footpad dermatitis and coccidiosis (Miles *et al.*, 2004) ^[58]. Regular litter turning, moisture control and proper ventilation help maintain healthy housing conditions.

11. Nutrition and Feeding in Organic Poultry Production

Nutrition and feeding management are crucial components of organic poultry production because they directly influence bird health, productivity, product quality and compliance with organic standards. Organic poultry feeding systems emphasize the use of natural, certified organic feed ingredients while avoiding synthetic chemicals, genetically modified organisms (GMOs), growth promoters and routine antibiotics (IFOAM, 2005). Since birds in organic systems often have outdoor access and greater physical activity, their energy and nutrient requirements may be higher than those of conventionally raised poultry (Sundrum, 2001) ^[79].

11.1 Organic Feed Standards: Organic feed standards require that feed ingredients be produced without synthetic fertilizers, pesticides, herbicides, chemical preservatives or sewage sludge (Codex Alimentarius Commission, 2007). The use of GMOs and GMO-derived ingredients is strictly prohibited to ensure ecological safety and maintain consumer confidence in organic products (IFOAM, 2005). Organic poultry diets must consist mainly of certified organic cereals, oilseed cakes, forage crops, minerals and natural supplements. The use of synthetic amino acids, antibiotics, artificial growth promoters and coloring agents is restricted or prohibited, making feed formulation more challenging in organic systems (Fanatico *et al.*, 2007) ^[28].

11.2 Feed Ingredients: Organic poultry diets commonly include maize and wheat as major energy sources due to their high digestibility and carbohydrate content (Leeson & Summers, 2001) ^[53]. Soybean meal is widely used as a protein source because of its favorable amino acid profile, although its availability in certified organic form may be limited (Fanatico *et al.*, 2007) ^[28]. Alternative protein ingredients such as sunflower cake, fish meal and alfalfa meal are also used to improve nutrient balance. Alfalfa meal supplies vitamins, minerals, fiber and natural pigments that enhance egg yolk color and antioxidant content (Ponte *et al.*, 2008) ^[67]. Mineral supplements including limestone, oyster shell and dicalcium phosphate are added to support bone development and eggshell quality.

11.3 Importance of Pasture: Pasture access is an essential feature of organic poultry systems. Birds grazing on pasture consume grasses, legumes, insects, worms and seeds, which supplement their nutritional requirements (Miao *et al.*, 2005) ^[57]. Green forage provides vitamins, minerals, antioxidants and carotenoids that improve immunity, egg yolk pigmentation, and meat quality (Ponte *et al.*, 2008) ^[67]. Pasture-based feeding can also increase beneficial omega-3 fatty acid levels in poultry products (Dal Bosco *et al.*, 2012) ^[17]. In addition, outdoor access promotes natural foraging behavior, physical activity and improved welfare while contributing to nutrient recycling and sustainable land management (Appleby *et al.*, 2004) ^[2].

11.4 Alternative Feed Resources: Organic poultry production increasingly utilizes alternative feed resources to improve sustainability and reduce feed costs. Insects such as black soldier fly larvae and mealworms are rich in protein and essential amino acids and can partially replace soybean meal

and fish meal (Makkar *et al.*, 2014) ^[56]. Azolla and duckweed are also valuable supplementary feed resources because of their high protein, vitamin and mineral content (Balaji *et al.*, 2009) ^[3]. Fermented feeds improve nutrient digestibility, gut health and feed efficiency by promoting beneficial microorganisms (Missotten *et al.*, 2013) ^[59]. Herbal additives including garlic, turmeric, ginger, neem and oregano are commonly used in organic systems for their antimicrobial, antioxidant and immune-enhancing properties (Windisch *et al.*, 2008) ^[89].

11.5 Feeding Strategies: Effective feeding strategies are necessary to maintain growth, egg production, immunity and welfare in organic poultry systems. Balanced diets containing adequate energy, protein, amino acids, vitamins, and minerals are essential for optimal performance (Leeson & Summers, 2001) ^[53]. Organic feeding programs often include phase feeding, pasture supplementation and the use of probiotics, prebiotics, enzymes and herbal additives to improve gut health and disease resistance (Windisch *et al.*, 2008) ^[89]. Clean and hygienic drinking water is equally important because water quality directly affects digestion, metabolism and overall flock health.

12. Health Management and Disease Control

12.1 Principles of Health Management: Health management is a key component of organic poultry production because the routine use of antibiotics and synthetic medications is highly restricted. Organic systems mainly rely on preventive healthcare practices that promote bird health through balanced nutrition, proper housing, sanitation, welfare management and environmental control (Van de Weerd *et al.*, 2009) ^[86]. Preventive measures such as adequate ventilation, clean water, good litter management, suitable stocking density, and stress reduction help minimize disease occurrence and strengthen the natural immunity of birds.

Organic poultry farming also encourages the use of natural feed additives including probiotics, prebiotics, vitamins, minerals, herbal extracts and essential oils to improve gut health and immune response (El-Saadony *et al.*, 2022) ^[22]. Outdoor access may further support immunity through controlled exposure to environmental microorganisms. However, proper management is essential to avoid excessive exposure to pathogens. Biosecurity is another important aspect of health management in organic poultry systems. Effective sanitation, restricted farm access, quarantine procedures, proper carcass disposal and pest control programs help prevent the introduction and spread of infectious diseases (Permin and Hansen, 1998) ^[64]. Since treatment options are limited, disease prevention is considered more important in organic systems than in conventional poultry production.

12.2 Vaccination Programs: Vaccination is widely accepted in organic poultry production as an essential preventive tool when disease risk cannot be controlled through management alone (USDA, 2023). Common vaccination programs include protection against Newcastle disease, Marek's disease, infectious bronchitis, infectious bursal disease and coccidiosis (Swayne and Glisson, 2020) ^[80]. Early vaccination, especially at hatchery level, is important for diseases such as Marek's disease. Vaccination schedules should be designed according to local disease prevalence, environmental conditions and production systems. Proper vaccine storage, handling and veterinary supervision are necessary to ensure effective immunity and disease control.

12.3 Alternative Therapies: Due to restrictions on antibiotics, alternative therapies are increasingly used in organic poultry farming. Herbal medicines such as garlic, turmeric, oregano, neem, thyme and aloe vera possess antimicrobial, antioxidant and immune-enhancing properties that support poultry health naturally (El-Saadony *et al.*, 2022)^[22]. Essential oils from oregano, thyme, cinnamon and eucalyptus have shown beneficial effects against bacterial and parasitic infections while improving gut health and feed efficiency (Brenes and Roura, 2010)^[10]. Probiotics are also commonly used to maintain healthy intestinal microflora and reduce harmful bacteria such as *Salmonella* and *E. coli* (Patterson and Burkholder, 2003)^[63]. Homeopathy is occasionally practiced in organic systems, although scientific evidence regarding its effectiveness in poultry disease management remains limited (Hektoen, 2005)^[39].

12.4 Biosecurity in Organic Systems: Biosecurity measures are essential for maintaining flock health in organic poultry farms. Regular cleaning and disinfection of poultry houses, feeders, drinkers and equipment help reduce pathogen load (Permin and Hansen, 1998)^[64]. Dry and clean litter management is especially important for controlling coccidiosis and bacterial diseases. Organic farms also implement visitor restrictions, protective clothing, footwear disinfection and quarantine procedures for newly introduced birds. Pest control programs target rodents, insects and wild birds that may spread diseases. Environmentally friendly methods such as trapping, sanitation and biological control are generally preferred over synthetic pesticides.

13. Egg and Meat Quality in Organic Poultry Production

The quality of poultry eggs and meat is one of the most important factors influencing consumer acceptance of organic poultry products. Organic poultry production systems differ significantly from conventional systems in terms of feeding practices, housing conditions, outdoor access and healthcare management, all of which may affect the physical, nutritional, sensory and microbiological quality of eggs and meat (Castellini *et al.*, 2008)^[14]. Consumers often associate organic poultry products with superior nutritional value, improved taste, enhanced animal welfare and safer food production practices. However, scientific findings regarding the actual quality differences between organic and conventional products remain variable and sometimes contradictory.

- **Egg Quality Parameters:** Egg quality is determined by several external and internal characteristics, including shell quality, yolk color, albumen quality, nutrient composition, freshness and sensory attributes. Organic poultry production systems may influence these characteristics due to differences in feeding, outdoor foraging and bird activity levels.
- **Shell Quality:** Eggshell quality is an important parameter because it affects egg safety, shelf life, hatchability and resistance to microbial contamination. Shell quality is generally evaluated based on shell thickness, shell strength, shell weight and shell cleanliness (Roberts, 2004)^[71]. Organic hens often have greater opportunities for exercise and access to natural sunlight, which may positively influence calcium metabolism and shell formation. Studies have reported that organic eggs sometimes exhibit thicker shells and improved shell strength due to better mineral utilization and outdoor exposure (Küçükyılmaz *et al.*, 2012)^[49]. However, shell quality may also vary depending on breed, age of hens,

nutritional status and environmental conditions. Some researchers have observed no significant differences between organic and conventional eggs regarding shell thickness and shell strength (Samman *et al.*, 2009)^[72]. Poor weather conditions, nutritional deficiencies and parasitic infestations in outdoor systems may negatively affect shell quality in some organic farms.

- **Yolk Color:** Yolk color is one of the most visible quality characteristics influencing consumer preference. Organic eggs often have darker and more intensely pigmented yolks compared with conventional eggs due to the consumption of green plants, insects and natural carotenoid-rich feed ingredients during outdoor foraging (Castellini *et al.*, 2006)^[13]. Natural pigments such as xanthophylls and carotenoids obtained from grasses, herbs and legumes contribute to deeper yellow or orange yolk coloration. Consumers frequently associate darker yolk color with better nutrition and freshness, although yolk pigmentation is primarily influenced by diet rather than nutritional superiority (Samman *et al.*, 2009)^[72]. Organic feeding systems that include pasture access may therefore improve the visual appeal of eggs and influence consumer purchasing behavior.
- **Nutritional Composition:** The nutritional composition of eggs is affected by genetics, feed composition, environmental conditions, and management practices. Several studies have reported that organic eggs may contain higher concentrations of omega-3 fatty acids, vitamins A and E, antioxidants and carotenoids compared with conventional eggs (Küçükyılmaz *et al.*, 2012)^[49]. Outdoor foraging and access to green vegetation contribute to the increased deposition of beneficial fatty acids and natural antioxidants in egg yolks. Organic eggs may also contain lower levels of pesticide residues and synthetic chemical contaminants because synthetic pesticides and feed additives are prohibited in organic production systems (Hughner *et al.*, 2007)^[42].

13.2 Meat Quality Parameters

Meat quality in poultry production is evaluated based on tenderness, flavor, juiciness, color, fat composition, protein quality and consumer acceptability. Organic poultry production systems can influence meat characteristics due to slower growth rates, increased physical activity, outdoor access and natural feeding practices.

- **Tenderness:** Tenderness is one of the most important sensory attributes determining meat quality and consumer satisfaction. Organic poultry meat is often produced from slower-growing breeds that require longer rearing periods compared with fast-growing conventional broilers (Fanatico *et al.*, 2007)^[28]. Increased movement and exercise in outdoor systems may result in firmer muscle texture and slightly lower tenderness. Some studies have reported that organic poultry meat is less tender than conventional broiler meat because of higher muscle activity and lower fat deposition (Castellini *et al.*, 2008)^[14]. However, many consumers perceive firmer texture as a sign of natural and traditional poultry production. Proper cooking methods and post-slaughter handling also influence meat tenderness significantly.
- **Flavor:** Flavor is another important characteristic influencing consumer acceptance of poultry meat. Organic poultry meat is often described as having stronger, richer and more natural flavor compared with conventionally produced meat (Fanatico *et al.*, 2007)^[28].

Outdoor access and diversified diets containing grasses, herbs, and insects may contribute to improved flavor development in organic poultry. The slower growth rate of organic birds may also enhance muscle maturity and flavor intensity. Consumer sensory studies have shown that many individuals prefer the taste and aroma of organic poultry products, although preferences may vary among different populations and cultural groups (Castellini *et al.*, 2008)^[14].

- **Fat Composition:** Fat composition is an important nutritional parameter because it influences both human health and meat quality. Organic poultry meat often contains lower total fat content and higher levels of polyunsaturated fatty acids (PUFAs), especially omega-3 fatty acids, compared with conventional poultry meat (Dal Bosco *et al.*, 2012)^[17]. Access to pasture vegetation and natural feed ingredients contributes to improved fatty acid profiles in organic poultry products. Higher omega-3 fatty acid concentrations are considered beneficial for cardiovascular health because they may reduce inflammation and improve lipid metabolism in humans (Simopoulos, 2002)^[75]. Organic poultry meat may also exhibit more favorable omega-6 to omega-3 fatty acid ratios than conventional meat.
- **Protein Quality:** Protein quality in poultry meat is generally high regardless of production system because poultry meat contains essential amino acids required for human nutrition. However, some studies suggest that organic poultry meat may contain slightly higher protein concentrations due to slower growth rates and lower fat deposition (Castellini *et al.*, 2008)^[14]. Physical activity in free-range systems may promote muscle development and lean tissue formation. Nevertheless, differences in protein quality between organic and conventional poultry meat are usually relatively small and may depend more on genetics, feed composition and slaughter age than organic management alone.

13.3 Nutritional Advantages of Organic Products

One of the primary reasons consumers prefer organic poultry products is the belief that they offer superior nutritional benefits. Several scientific studies support the view that organic eggs and meat may contain higher concentrations of beneficial nutrients such as omega-3 fatty acids, antioxidants, vitamins and carotenoids (Średnicka-Tober *et al.*, 2016)^[77].

- **Omega-3 Fatty Acids:** Organic poultry products frequently contain higher levels of omega-3 fatty acids because birds raised in pasture-based systems consume green plants rich in alpha-linolenic acid (ALA), a precursor of omega-3 fatty acids (Dal Bosco *et al.*, 2012)^[17]. Increased omega-3 intake is associated with reduced cardiovascular disease risk, improved brain function and anti-inflammatory effects in humans (Simopoulos, 2002)^[75].
- **Antioxidants:** Organic eggs and meat may also contain higher concentrations of antioxidants such as vitamin E, carotenoids, lutein and selenium (Küçükyılmaz *et al.*, 2012)^[49]. Antioxidants help protect body tissues against oxidative stress and may contribute to improved immune function and reduced chronic disease risk.
- **Reduced Chemical Residues:** Organic poultry production prohibits the routine use of synthetic pesticides, antibiotics and growth promoters, which may reduce chemical residues in poultry products (USDA, 2023). Consumers often perceive organic foods as safer

because of reduced exposure to potentially harmful chemical substances. Lower antibiotic use in organic systems may also contribute to reduced antimicrobial resistance concerns.

14. Food Safety Concerns in Organic Poultry Production

Food safety remains a critical issue in both organic and conventional poultry systems. Organic poultry farming, particularly systems with outdoor access, may expose birds to environmental contaminants such as wild birds, rodents, insects and contaminated soil, increasing the risk of pathogen transmission (Van de Weerd *et al.*, 2009)^[86].

14.1 Microbial Contamination: Poultry meat and eggs can become contaminated during production, processing, storage or transport. Important foodborne pathogens associated with poultry products include *Salmonella*, *Campylobacter* and *Escherichia coli* (Humphrey, 2006)^[43]. Outdoor production environments may increase microbial exposure if hygiene and biosecurity practices are poorly managed. However, research findings are inconsistent, with some studies reporting higher contamination in organic products while others show little difference between organic and conventional systems (Radu *et al.*, 2007)^[68]. Therefore, strict sanitation, vaccination and regular pathogen monitoring are essential in organic poultry production.

14.2 Pathogen Control Strategies: Since antibiotic use is limited in organic farming, disease prevention mainly depends on management practices. Effective biosecurity, proper litter handling, clean feed and water, and vaccination programs are important measures for controlling disease spread (Swayne and Glisson, 2020)^[80]. Natural alternatives such as probiotics, organic acids and essential oils are also increasingly used to improve gut health and suppress harmful microorganisms. In addition, hygienic slaughtering practices and proper cold-chain storage are necessary to maintain product safety and minimize contamination risks.

15. Environmental Impact and Sustainability of Organic Poultry Farming

Organic poultry production is widely regarded as a more environmentally sustainable system than intensive conventional poultry farming because it emphasizes ecological balance, biodiversity conservation and reduced chemical use. Conventional systems are often linked with greenhouse gas emissions, water pollution, soil degradation and excessive chemical inputs (FAO, 2013). Organic farming aims to reduce these impacts through natural production practices and nutrient recycling (Reganold and Wachter, 2016)^[70]. One major advantage of organic poultry farming is the avoidance of synthetic pesticides, fertilizers and antibiotics. Organic feed crops are produced without synthetic agrochemicals, reducing soil and water contamination and helping preserve beneficial soil organisms and wildlife (Pimentel *et al.*, 2005)^[66]. Organic farms also tend to support greater biodiversity through pasture-based systems, mixed farming and crop rotation practices (Bengtsson *et al.*, 2005)^[5].

Organic poultry systems contribute to improved soil fertility because poultry manure is recycled as organic fertilizer. This enhances soil structure, microbial activity and nutrient availability while supporting long-term soil productivity (Lampkin, 1997)^[51]. Proper manure management and composting further reduce environmental pollution and improve nutrient cycling. Organic poultry farming may also

lower dependence on fossil fuel-based inputs and improve resource recycling, potentially reducing environmental emissions (Tuomisto *et al.*, 2012) ^[82]. However, some studies suggest that lower productivity and slower growth rates in organic systems may increase greenhouse gas emissions per unit of product compared with conventional systems (De Vries and De Boer, 2010) ^[19]. Water quality protection is another environmental benefit of organic systems. Limited chemical use and controlled manure application reduce nutrient runoff and water contamination risks (Morse *et al.*, 2012) ^[60]. Furthermore, diversified farming systems and improved soil health increase resilience to climate variability and environmental stress (Scialabba and Müller-Lindenlauf, 2010) ^[73].

Despite these advantages, organic poultry farming also faces challenges, including higher land requirements, exposure to predators and diseases and lower production efficiency (Van de Weerd *et al.*, 2009) ^[86]. Therefore, achieving a balance between environmental sustainability and productivity remains a major goal in organic poultry production.

16. Marketing and Marketing Channels for Organic Poultry Production

Marketing plays a vital role in the success and sustainability of organic poultry farming. Organic poultry products usually have higher production costs because of expensive organic feed, certification requirements, labour-intensive management and strict animal welfare standards (Willer and Lernoud, 2021) ^[87]. Therefore, efficient marketing strategies are necessary to obtain premium prices and maintain farm profitability. Growing consumer demand for healthy, environmentally friendly and ethically produced food has created strong market opportunities for organic poultry meat and eggs worldwide (Hughner *et al.*, 2007) ^[42]. Unlike conventional poultry marketing, organic poultry marketing emphasizes both product quality and production methods. Consumers are increasingly concerned about food safety, animal welfare, environmental protection and the absence of synthetic chemicals in food production (Yiridoe *et al.*, 2005) ^[90]. As a result, marketing strategies often highlight features such as “organic certified,” “antibiotic-free,” “free-range,” and “eco-friendly” to build consumer trust and product differentiation. Health-conscious consumers generally perceive organic poultry products as safer and nutritionally superior due to lower chemical residues and improved animal welfare practices (Castellini *et al.*, 2008) ^[14]. Rising concerns about antimicrobial resistance and environmental degradation have further strengthened demand for organic poultry products (Reganold and Wachter, 2016) ^[70].

16.1 Marketing Channels for Organic Poultry Products

- **Direct Marketing:** Direct marketing is highly beneficial for small-scale organic poultry producers because it allows farmers to sell products directly to consumers without intermediaries. Common methods include farm-gate sales, roadside marketing, home delivery and community-supported agriculture programs (Brown, 2003) ^[11]. This approach improves farmer-consumer relationships, increases transparency and enables producers to retain a larger share of profits (Tregear and Cooper, 2016) ^[81]. However, it requires additional effort in packaging, promotion, transportation and customer management.
- **Farmers’ Markets:** Farmers’ markets provide important opportunities for organic poultry producers, especially in

urban and peri-urban areas with growing demand for organic foods. These markets allow direct interaction between producers and consumers, helping farmers educate buyers about organic standards, nutritional benefits and animal welfare practices (Brown, 2003) ^[11]. Farmers’ markets also strengthen local food systems and improve customer loyalty, although challenges such as seasonal demand and transportation costs may affect profitability.

- **Retail Stores and Supermarkets:** Large-scale organic poultry producers often market their products through supermarkets and retail stores. Increasing consumer demand has encouraged retailers to create specialized organic food sections (Hughner *et al.*, 2007) ^[42]. Supermarkets provide broad market access and continuous demand, but producers must meet strict standards related to certification, packaging, product quality and supply consistency. Small producers may face difficulties meeting the volume and logistical requirements of major retail chains.
- **Online Marketing and E-commerce:** Digital marketing and e-commerce have become rapidly expanding channels for organic poultry products. Websites, mobile applications and social media platforms enable producers to reach wider markets and communicate directly with consumers (Liang, 2020) ^[55]. Online platforms also allow producers to share information regarding certification, farm practices and product quality. The COVID-19 pandemic significantly accelerated online food purchasing and home delivery services. Despite these advantages, maintaining product freshness and efficient cold-chain logistics remains challenging for perishable products such as eggs and poultry meat.
- **Cooperative Marketing:** Cooperative marketing is especially valuable for smallholder farmers who may lack infrastructure, resources and bargaining power. Producer cooperatives help farmers collectively market products, reduce transportation costs and improve access to certification, storage, processing and branding services (Tregear and Cooper, 2016) ^[81]. Cooperative systems also encourage technical training, knowledge sharing and stronger market competitiveness.

16.2 Branding and Certification in Organic Poultry Marketing

Branding and certification are essential for building consumer confidence in organic poultry products. Certification labels such as USDA Organic, EU Organic, India Organic and Soil Association assure consumers that products comply with recognized organic standards (USDA, 2023). Effective branding strategies often emphasize features such as “free-range,” “pasture-raised,” “hormone-free” and “animal welfare approved” to distinguish organic products from conventional alternatives (Yiridoe *et al.*, 2005) ^[90]. In addition, traceability technologies such as QR codes, blockchain systems and digital supply-chain monitoring are increasingly used to improve transparency and prevent fraudulent labeling (Galvez *et al.*, 2018) ^[36].

17. Challenges and Future Prospects of Organic Poultry Production

Organic poultry production faces several challenges despite increasing global demand for organic meat and eggs. One major challenge is the high cost of production due to expensive organic feed, certification requirements, larger

housing space and labour-intensive management practices (Fanatico *et al.*, 2009) ^[26]. Organic feed ingredients are costly because they must be produced without synthetic chemicals or genetically modified organisms. In addition, slower-growing poultry breeds increase feed consumption and production time. Disease control is another important challenge because the use of antibiotics and synthetic medicines is restricted in organic systems. Outdoor production exposes birds to pathogens, parasites and wild birds carrying infectious diseases (Van de Weerd *et al.*, 2009) ^[86]. Therefore, effective biosecurity, vaccination and preventive health management are essential. Limited availability of certified organic feed and lower productivity compared with conventional systems also reduce economic efficiency (Sundrum, 2001) ^[79].

Certification procedures and regulatory compliance can be difficult and expensive, especially for small-scale farmers (Yiridoe *et al.*, 2005) ^[90]. Poor market infrastructure, inadequate cold storage and competition from cheaper conventional poultry products further limit market growth (Willer and Lernoud, 2021) ^[87]. Environmental challenges such as climate change, heat stress and predator exposure also affect organic poultry systems. Despite these constraints, the future prospects of organic poultry farming remain promising. Increasing consumer awareness regarding food safety, animal welfare, environmental sustainability and antimicrobial resistance is driving demand for organic poultry products (Reganold and Wachter, 2016) ^[70]. Technological innovations such as precision farming, automated monitoring systems and digital traceability tools may improve productivity and disease management (Berckmans, 2017) ^[6]. Research on alternative feed resources, including insects, algae and probiotics, may reduce feed costs and improve sustainability (Makkar *et al.*, 2014) ^[56]. Natural disease-control methods such as herbal additives, probiotics and essential oils are also gaining importance as alternatives to antibiotics (El-Saadony *et al.*, 2022) ^[22]. Government support, certification subsidies and increasing international trade opportunities are expected to further promote the growth of organic poultry farming in the future.

18. Conclusion

Organic poultry production is a sustainable alternative to conventional poultry farming that emphasizes animal welfare, environmental protection and safe food production. The system promotes the use of organic feed, outdoor access, natural health management and reduced dependence on synthetic chemicals and antibiotics. Organic poultry farming also contributes to biodiversity conservation, soil fertility improvement and sustainable resource utilization. Although challenges such as high production costs, disease management, lower productivity and certification requirements remain significant, increasing consumer awareness and demand for healthy and eco-friendly products continue to support the growth of the organic poultry sector. Advances in technology, alternative feed resources and improved management practices are expected to enhance the efficiency and sustainability of organic poultry production in the future.

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