

Poultry Production and Its Role in Food Systems

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ABSTRACT

The poultry farming is a fast growing livestock industry and it is a significant part of the modern food systems across the globe. Due to its efficiency in production, short growth period, and wide acceptance by the consumers, poultry offers the low-cost and consistent source of animal protein in the form of meat and eggs. This review discusses poultry production in the food system, which provides contribution to food availability, food security, nutrition and economic development. The article talks about various poultry production systems such as the backyard and small-scale poultry production to the intensive commercial poultry production and their contributions to both the local and global food supply chain. Moreover, such important points as poultry value chains, food safety, economic significance, and significant production issues are examined. Future outlooks of enhancing production of poultry to sustain increasing food demand is also discussed in the paper. This review highlights the significance of poultry production in improving the performance of the food system and guaranteeing the availability of safe and healthy food items at all times.

INTRODUCTION

The production of poultry products is a crucial factor in modern food system as an inexpensive, reliable and acceptable source of animal food. During the last several decades, the consumption of poultry meat and eggs in the world population has grown significantly because of the increase in population, urbanizing process, the growth of incomes, and alteration of the nutrition. Poultry production has grown at a high rate as compared to other livestock industries due to its quick



production cycle, a high production to feed ratio and the low production costs [1]. This has made poultry products one of the most crucial food systems in the developed and developing states.

Food systems refer to all activities and processes that are involved in food production, processing, distribution, consumption and waste management. In this context, poultry production plays the key role linking the primary agricultural production to the food processing industry, the food markets, and the consumers. Both poultry meat and eggs are important sources of animal protein, important amino acids, vitamins and minerals, which, in turn, assist human nutrition and food variety. The poultry products are being consumed by many regions and people due to the reduction of cultural and religious restrictions that would have constrained its consumption as compared to other meats [2].

Poultry production is also a significant livelihood activity in a large number of countries in low and middle income, especially the smallholder and backyard farmers. Small-scale poultry production involves relatively low start-Up costs and it can be incorporated with other production systems. This renders it a convenient source of income, labor and food to the household particularly among women and households that are poor in resources [3]. Simultaneously, intensive industrial poultry production serves as a major source of fulfilling the food requirements in urban areas and nationally and internationally to provide the poultry markets. Nevertheless, poultry production is experiencing a number of challenges in the food system such as outbreak of diseases, feeds, fluctuation of prices, food safety, and environmental pressure in spite of its significance. These issues are critical to tackle in order to guarantee the effectiveness, sustainability, and resiliency of food systems. Researchers, policymakers and industry stakeholders, therefore, need to have a comprehensive knowledge of the interaction of poultry production with various aspects of the food system [4].

This review will analyze the poultry production under the food systems context to indicate the contribution of poultry production to food availability, nutrition, the development of the economy, and food safety. The synthesis of the existing literature allows the article to offer its integrated view on the role of poultry production and define the main challenges and directions how this contribution to the global and regional food systems can be strengthened.

OVERVIEW OF POULTRY PRODUCTION SYSTEMS

The production systems of poultry are diverse depending on the regions and they are affected by availability of resources, technological advancement, market demand and socio-economic status. These systems are as simple as backyard and small scale operations to the highly intensive commercial ones. The poultry production systems are diverse and it is important to understand the systems in order to evaluate their role in the food systems and their contribution to food availability and livelihoods. Poultry systems in backyards or villages are the usual rural systems in developing

nations. Such systems are also identified by low input and low output management where birds are raised on free-range or scavenging environments. Much of the time local or indigenous breeds of poultry are used because of the adaptability to the harsh environment, disease resistance and the ability to survive on low feeds. Though the productivity in the backyard systems is rather low, these systems are significant in the household nutrition and earning money. They give direct access to families to eggs and meat and act as a buffer in the economic stress [5].

Most developed nations are dominated by intensive commercial poultry production systems, which are being rapidly developed in the developing parts of the world. These systems entail heavy stocking rates, selective breeds, formulated feeds, modern housing, as well as, rigorous biosecurity. Commercial systems are very efficient and able to generate high volumes of poultry meat and eggs at a relatively low cost hence they are important in satisfying the increasing urban and global demand [6]. They are however also expensive in terms of capital investment and more susceptible to changes in the market and outbreak of illnesses.

Every poultry production system makes an input to food systems differently. Commercial operations are needed to guarantee mass supply and market stability, whereas smallholder and backyard systems are needed to sustain rural lives and food accessibility. The improvement of the overall functioning of food systems needs an integrated approach that would identify the advantages and drawbacks of each system. Knowledge of these production systems gives a platform on which to design policies and interventions that enhance productivity, resilience and equitable access to poultry products [7].

POULTRY IN THE FOOD SYSTEM

Poultry also plays a central role in the food system between the agricultural production and the processing industries, distribution channels, markets or consumers. Poultry, being one of the fastest-growing livestock industries in the world, plays an important role in the supply and access of animal-based foods. Poultry meat and poultry eggs are consumed actively because of their affordability and nutritional value as well as the lack of cultural or religious beliefs that can limit their consumption, indicating that they are an inseparable part of food systems in different areas [8].

Under the production component of the food system, poultry farming forms a source of raw materials in the form of live poultry birds, eggs and poultry meat. These products undergo different value chain processes, such as processing, storing, transport and retailing. Modern poultry processing plants are significant in relation to product quality, shelf life, and food safety by means of grading, packaging, refrigeration, and value addition. Cold chain infrastructure has enhanced further the significance of poultry in food systems since it allows the effective delivery of the products to distant and urban markets [9]. There are different levels of value chains of poultry based on the development of the

system. Traditional food systems have been characterized by localized sale of poultry products in informal market where producers deal directly with consumers. Such systems contribute to the local economy and offer fresh products, but they might be exposed to issues associated with hygiene and quality control [10].

MAIN STAGES OF THE POULTRY VALUE CHAIN

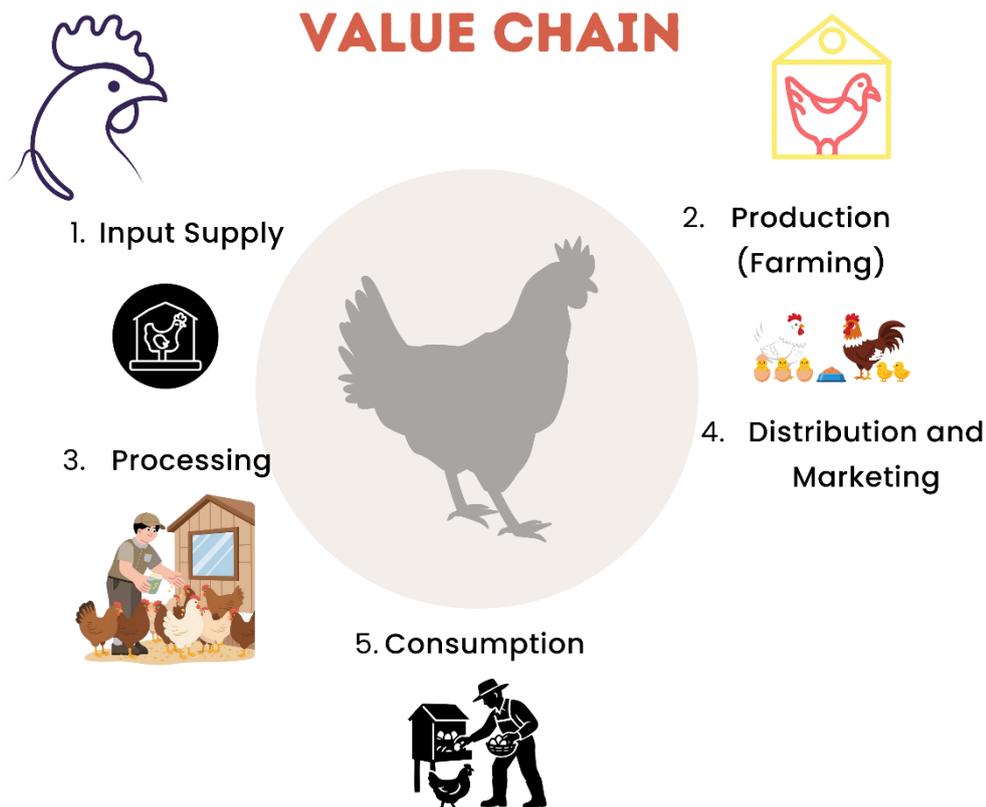


Figure 1. Main stages of the poultry value chain

Poultry also provides stability to the food system by providing an animal protein that is rather quick and flexible consumption. The brief production cycles enable the producers to react fast to the fluctuations in demand to aid in mitigating disparities in supply. Moreover, production of poultry consumes less land and water than other species of livestock, hence it can be used in areas with insufficient natural resources. This productivity increases the contribution of poultry in sustaining food supply especially the high-populated and urbanizing regions [11]. In addition to food supply, poultry by-products like feathers, manure, and waste processing are used in the rest of the food and agricultural system.

Organic fertilizer is commonly poultry manure, which helps in crop production and recycling of the nutrients. These connections underscore the interrelationship that exists in food systems in poultry production. Poultry has a complex role in food systems because it helps in maintaining food

availability, integration of the market, economic activity, and resource efficiency [12]. Knowledge of these interactions is important towards enhancing the performance of food systems and the steady supply of safe and nutritious poultry products.

POULTRY AS A SOURCE OF FOOD SECURITY AND NUTRITION

The poultry production also contributes greatly to food security and nutrition through the enhancement of availability, accessibility, and consumption of animal-source foods. Poultry meat and eggs are considered one of the most effective and cheap sources of high protein foods and thus they are indispensable ingredients of a diet of both developed and developing nations. Poultry products have a low cost of production and are widely accepted to ensure their products reach a wide range of population groups, and this includes low-income households. Nutritionally, poultry meat contains the essential amino acids, specific vitamin A, including B-complex vitamins, and minerals including iron, zinc, and phosphorus. Eggs are also rich in nutrients, they are rich in high-quality protein, essential fatty acids, vitamins A, D, E, B12, and other important micronutrients, including selenium and choline [13]. These are important nutrients that aid the human development in terms of growth, cognitive development, immune system and health. The frequent intake of poultry products will be helpful in correcting the protein-energy malnutrition, as well as the micronutrient deficiencies, particularly in children, pregnant women, and elderly people [14].

Poultry helps us to have food security as it provides us with a stable and efficient source of animal food produce with short production cycle. Poultry, in contrast to larger livestock species, can be reproduced within a short time, which allows responding quickly to demand in food and prevents a situation of long-term deficit. Eggs especially are a steady and dependable food supply even in the small scale and backyard production systems [15]. This renders poultry particularly useful in areas that are rural and resource-restricted, in which access to other food of animal origin can be restricted. Besides direct consumption, poultry production brings about food security indirectly due to the income generation. Poultry is also an important source of cash to smallholder farmers who can use the funds to buy other foods and satisfy household demands. Such access to food based on income enhances the food security generally and increases the dietary diversity. The chicken rearing is also a common practice run by women and therefore leads to the empowerment of women and the resulting increase in nutrition in the household [16].

Poultry’s Contribution within Animal Protein Supply

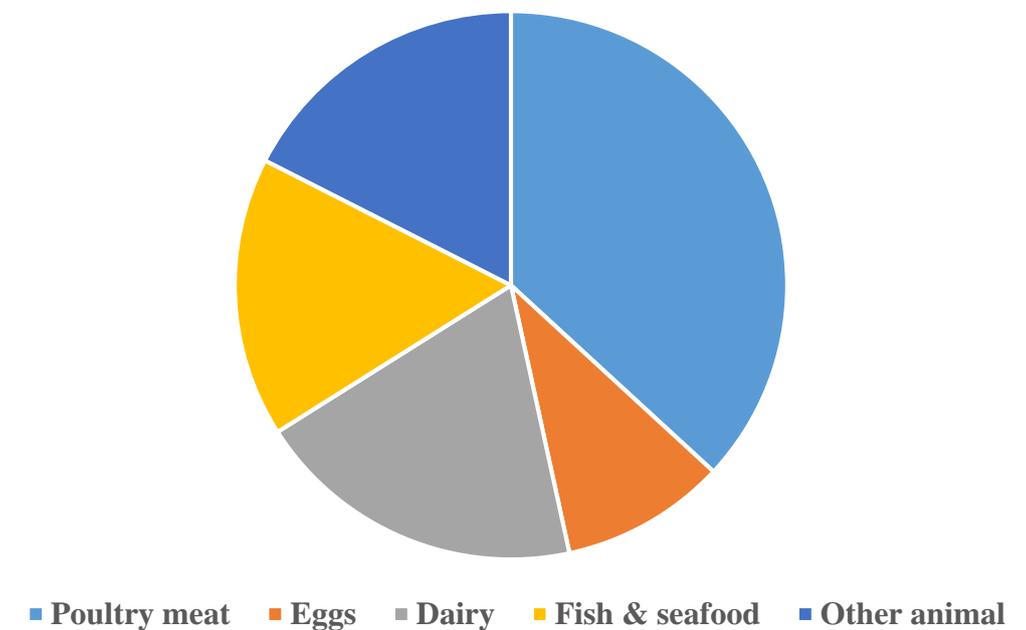


Figure 2. Poultry contribution within animal protein supply

Poultry products are ideal to be added to nutrition sensitizing food system and health interventions by the community. School feeding programs, maternal nutrition programs, and emergency food programs often include eggs and poultry meat as they are very nutritious and easy to prepare. Also, the fat content of poultry products is comparatively lower than in red meat, and it is in line with the dietary recommendations on balanced and healthy diets. Poultry production is an important factor in terms of food security and nutrition as well as income production and improving the variety in the diet [17]. Enhancing poultry production in food systems can consequently play an important role towards enhancing better nutrition and human health.

ECONOMIC IMPORTANCE OF POULTRY PRODUCTION

The production of poultry is a significant economic driver in the food systems, where it can be a source of income, jobs and trade in the local, national and international economies. The industry is among the proliferating branches of animal farming as a result of increased demand of poultry meat and eggs as a result of population expansion, urbanization, and diet shift. Consequently, poultry farming is critical towards boosting agricultural economies and livelihoods. At farm level, the production of poultry is a stable source of income to millions of households especially in the developing nations. Backyard and smallholder poultry systems do not need a lot of capital equipment

and can be brought into quick financial benefits because of the brief production cycles [18]. The money earned by selling eggs, live birds, or poultry meat assists households to cover their day-to-day needs, invest in education and health, as well as enhance the general living standards. Economic opportunities Poultry farming is also a source of economic opportunities to women and youth, which improves social inclusion and rural development [19].

In addition to the direct production, the poultry industry has been seen to contribute greatly to other allied industries, such as feed production, veterinary care, equipment provision, processing, transportation, and retailing. Both upstream and downstream operations generate a lot of employment and economic activity along the poultry value chain. Commercial poultry enterprises and processing plants employ large quantities of people and provide a substantial contribution to urban development and growth in most countries [20]. The production of poultry also contributes to the national and international trade. Poultry is the most popular commodity that is exported and also brought in, as a source of export and foreign exchange incomes in a number of countries. The production cycle and high productivity of poultry is relatively short and high productivity is enabling the producers to react to market demand within a short time enhancing market efficiency and stability of prices. Nevertheless, economic performance of the sector can be affected by fluctuations in the market, costs of inputs and trade regulations [21].

Poultry production also helps create resilience in the economy as it gives a variety to sources of agricultural income. By the integration of poultry in mixed farming systems, the farmers will not depend on crop production alone and hence they will be exposed to less economic risk due to climatic variations and market uncertainties. Poultry manure also is an added value since it is used as an organic fertilizer, where input expenses are low to crop production. Poultry production is one of the main economic sources in the food systems which contributes to income, employment, industrial development, and trade [22]. The contribution of poultry sector to inclusive and sustainable economic development can be strengthened by improving its economic performance via better management, infrastructure, and ease of accessing markets.

POULTRY PRODUCTION AND FOOD SAFETY

Food safety is an important aspect of the food systems and the production of poultry meat bearing in mind that poultry meat and eggs are extensively consumed all over the world. Safety of poultry products is a critical factor that helps to safeguard the consumers against foodborne diseases as well as help in ensuring confidence in food supply chains. The poultry products are also very prone to contamination due to their high moisture content and the various processes undergone between farm and the table. The aspect of food safety in the production of poultry starts at the farm level [23]. The

environment that keeps the birds healthy must be through good management practices, good housing, clean water and balanced nutrition in order to minimize the chances of developing diseases. The introduction and spread of pathogens are reduced with the help of such biosecurity measures as control of farm access, avoiding contact with wild birds, and high standards of hygiene. Safe production of poultry is also achieved with vaccination schemes and the prudent use of veterinary pharmaceuticals [24].

In processing and slaughter, poultry products are exposed to the possibility of being contaminated in case of poor hygiene practices. Salmonella and Campylobacter are also common pathogens that are linked with poultry products and that are very dangerous to the human body. This needs proper slaughtering methods, clean processing facilities, and frequent inspection to minimize the microbial contamination. Food safety management systems such as Hazard Analysis and Critical Control Point (HACCP) are important in the identification of food safety risks and the control of the food safety hazard along the poultry value chain [25].

Another poultry production aspect that is important is egg safety. To avoid contamination and preserve quality, it is important to ensure proper collection of eggs, cleaning, storage and packaging. Damaged or wrongly stored eggs may become a source of food bacteria. Rules and quality guidelines avert the delivery of eggs that are not safe and fit to be consumed to the consumer. Food systems are closely related to poultry production and food safety. Enhancing food safety throughout the food production and distribution chain of poultry is necessary in decreasing health hazard, limiting economic damages as well as availing safe and wholesome poultry products [26]. A combined effort between producers, processors, regulators, and consumers is needed in order to enhance food safety results in the poultry-based food systems.

FOOD SYSTEMS PROBLEMS IN POULTRY PRODUCTION

Although poultry production provides a considerable contribution to food systems, it has been associated with several challenges that impact the productivity and profitability of the food production, as well as the stability in various regions. These problems are caused by biological, economic, environmental, and institutional factors, and the solution to these problems is important to ensure the stability of the supply of poultry products in the food systems. Diseases and health-related problems are one of the biggest problems in the poultry production [27]. Avian influenza, Newcastle disease and infectious bursal disease are viral infections that result into high mortality and devastating economic losses to the poultry, making it highly vulnerable to infectious diseases. Epidemics interfere with production, add to the lack of confidence in the consumer, and can result in trade restrictions. Low biosecurity, access to lack of veterinary care and disease surveillance systems further increase

these risks especially in small-scale and backyard production systems [28].

Another problem confronting poultry production is based on infrastructure and access to market. The inadequate housing facilities, absence of advanced processing facilities, poor cold storage and unproductive transport systems compromises quality of products and causes high losses after the harvesting period. Small scale producers have a challenge in penetrating formal markets because they lack bargaining power, are not certified and supply varies [29]. This limits their capacity to take advantage of the existing rising demand of poultry products. Other challenges in food systems are food safety and regulatory compliance. Hygiene, processing technologies and quality control systems needed to meet the food safety standards may be expensive to small and medium-scale producers. There are also weak enforcement of regulations and informal structures in the market, which may complicate the process of ensuring safe poultry products [30].

Another poultry production problem that is emerging is environmental and social concerns. Environmental pressures can be caused by waste management, water consumption, and emissions of intensive poultry operations in case of their inadequacy. Moreover, the workplace, animal welfare and societal attitudes also affect the acceptability of poultry production systems. These issues point to the sophistication of poultry food production in food systems. To deal with them, there must be concerted efforts that entail enhanced management practices, conducive policies, infrastructure investment, and capacity building along the poultry value chain [31].

OUTLOOK OF POULTRY IN FOOD SYSTEMS

The future of poultry production in the food systems is likely to continue growing as the world population demand of inexpensive and nutritious animal products may be projected to keep on increasing. The increase in population, urbanization, and alteration of dietary habits would probably boost the intake of poultry meat and egg, making the poultry industry an important source of food and nutrition. In order to sustain this increasing demand, the production systems of poultry will be forced to change and evolve in line with the new challenges and opportunities emerging in the food systems [32]. It is predicted that technological changes are to have significant impact on the future of poultry production. The productivity and efficiency can be increased through the use of improvements in genetic, nutrition, housing, and health management as well as the decrease in costs of production. There has been an uptake of precision feeding, digital monitoring tools and data driven management tools to ensure the optimization of the performance of birds and enhanced decision making. Such innovations can be used to strengthen poultry value chains and enhance uniformity in supply [33]. The future of poultry production will also be dependent on feed innovation. Dependence on conventional feed ingredients can be minimized by exploring alternative feed resources that are either

locally available like agro-industrial by-products or new protein resources that are more resilient to changes in prices. Improved nutrient consumption and productivity at the feed level will facilitate the stable production and help to create more efficient food systems. The establishment of closer relations between smallholder and commercial poultry farmers will matter to the inclusive development of the food system [34]. Farmers, small scale farmers can be assisted by providing them with better inputs, training, veterinary services, and connecting them with markets in order to improve their livelihood and productivity. Simultaneously, better coordination throughout the poultry chain of value can alleviate the inefficiencies, reduce losses and gain better quality control [35].

The future of food systems poultry will continue to focus on food safety and quality assurance. It will be required to focus more on biosecurity, hygienic processing, infrastructure of cold chain, and enforcement of regulation to ensure that the health of people is safeguarded and that consumers have confidence. Safe handling and consumption practices will also be enhanced through education and awareness programs to the producers and consumers [36]. The future trend of poultry production will also be affected by policy support and institutional structures. Poultry systems can be equipped by investing in infrastructure, research and extension services to enhance their role in food systems. The best practices can be adopted at international levels with the help of international cooperation and knowledge sharing [37]. Poultry production has a great potential to assume a more significant role in the food systems of the future. Its contribution to food availability, nutrition and economic development will require strategic planning, innovation and concerted stakeholder efforts to maximize it.

CONCLUSION

In the contemporary food systems, poultry production has become central and dynamic, and it has so much to do with the availability of food, nutritional values, economic growth, and also market stability. As pointed out in this review, poultry industry has been growing rapidly because it is efficient and cheap, production cycles are short and consumers generally accept it. The use of poultry meat and eggs has become critical in the diet of various socio-economic and cultural setups, which further supports the significance of poultry production towards addressing the increased demand in the consumption of animal-based foods in the world population. Poultry can contribute to food systems on various levels due to the variety of production systems, which include backyard and smallholder, as well as intensive commercial ventures. Small and village poultry systems contribute to the food security of the household, generation of income and livelihood of rural areas, and large commercial systems promote the supply of food to urban markets and national and international trade. These systems together help sustain local food access as well as the overall food distribution which shows

the flexibility of poultry production across various food system scenarios.

The role of poultry in food security and diet is especially high. Poultry and eggs contain large amounts of quality protein, and important micronutrients, which are necessary and pivotal to human health and growth. Their supplement to domestic diets, nutrition programs, and community food projects take the side to resolve malnutrition and enhance dietary diversity. Moreover, the revenue of poultry production makes the access to food stronger because households can now afford other services and essentials. The poultry industry, in terms of the economy, benefits millions of people in terms of livelihoods, and also sparks growth throughout the entire value chain, such as feed production, processing, transportation, and retailing. It is an important source of agricultural and industrial growth as well as providing women and youth with an opportunity to participate.

Meanwhile, poultry production also leads to trade and market efficiency even though it is sensitive to the input costs, outbreaks of diseases, and market variations. In poultry-based food systems, food safety is an imperative factor to consider. To safeguard the health of the people and consumer confidence, safe production, processing, distribution of poultry products is vital. Biosecurity, hygienic processing, cold chain, and regulatory systems should be effective in reducing the risk of foodborne and guaranteeing the quality of products. Although poultry production has its benefits, it is subjected to a number of challenges, some of which include risk of diseases, limitation of feed, and limitation of infrastructure and pressure of laws.

To overcome these challenges, there should be concerted efforts among the stakeholders which are facilitated by research, policy interventions and capacity building. In the future, the future role of poultry in the food systems will be determined by technological innovation, better management practices and more integration of the production systems. Production of poultry is an extremely important food systems pillar and has extensive effects on nutrition, livelihoods, and economic progress. In order to increase the contribution of poultry to sustainable, efficient and equitable global food systems, it will be critical to strengthen its production in informed policies, innovation, and inclusive ways.

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