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Alternative species in poultry farming and their economic, social, and cultural importance

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ABSTRACT

Within the livestock sector, poultry farming has advanced with technological developments, made significant contributions to the global economy. Among poultry, nearly all the demand for white meat and table eggs is met through commercial chicken farming. In addition to chicken meat and eggs, the farming of other poultry species such as ducks, turkeys, geese, quails, partridges, pheasants, and guinea fowl is also carried out as alternatives. The meats of these poultry species, particularly, as well as other by-products obtained, are establishing their presence in the international market. They are significant not only for providing extensive employment opportunities but also for their substantial contributions to national economies. The primary purpose of raising poultry species varies by country worldwide. While some of these poultry species are primarily raised for meat, egg, and feather production, others hold significant importance as hunting birds. Poultry farming holds significant importance in the social and cultural lives and beliefs of many countries. In addition, poultry species associated with special occasions are an integral part of the cultural traditions in many countries. In this review, poultry farming, which has been an important sector from past to present, has been approached from a different perspective, and the importance of the sustainability of this sector has been addressed in terms of habits and culture.

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Introduction

As a result of the gradual increase in the world population, poultry farming plays a crucial role in fulfilling nutritional and protein needs. Poultry meat and eggs are mass consumer products, serving as the primary source of affordable protein worldwide. Generally, producing 1 kg of poultry meat requires 2–2.5 kg of feed, while 1 kg of red meat requires over 7 kg. The price of 1 kg of red meat equals 3–4 kg of poultry meat, making poultry meat cheaper and more accessible. Factors sustaining interest in the poultry industry include short growing periods, mass production of uniform-age chicks, lower production costs compared to red meat, and poultry meat's high nutritional value (Wahyono and Utami, 2018). The fact that many religions impose few significant restrictions on the consumption of poultry also contributes to its popularity. Additionally, poultry eggs are among the few foods consumed without restriction in most geographical regions and religions (Guyonnet, 2023).

Consumption levels of poultry meat and eggs vary depending on geographical, regional, and developmental differences (Magdelaine et al., 2008; Wahyono and Utami, 2018; Yazdekhasti et al., 2021). Among poultry species, 88.82% of white meat and 97% of table eggs are provided from commercial chicken farming (FAO, 2022). Other poultry species are also widely cultivated as alternatives to chicken meat and eggs, and to enhance nutrient diversity. Poultry species

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such as ducks, turkeys, geese, quail, partridges, pheasants, and guinea fowl are referred to as alternative poultry (Arslan and Çetin, 2022). Consumption of poultry and pork is quite common worldwide. However, pork consumption has decreased due to diseases such as swine fever. This situation has contributed to the widespread consumption alternative poultry species of meat (Vorona and Makarynska, 2022). Some countries have become prominent in the breeding of these poultry species, and their meat and other by-products have gained significant importance in the international market (FAO, 2022).

Rapid technological advances and the development of modern poultry houses have led to significant improvements in poultry breedeing (Wu et al., 2022). In commercial hatcheries and slaughterhouses, thousands of poultry eggs are incubated simultaneously and subsequently raised and slaughtered through various breeding systems. Despite production is conducted using modern systems, ensuring animal welfare requires that poultry be raised in less confined spaces and have access to roaming areas (El Jeni et al., 2021). Thus, worldwide poultry farming is carried out under extensive conditions with traditional methods, under semi-intensive conditions considering animal welfare, and under intensive conditions in order to meet the increase in production in a shorter time, to obtain more yield, to reduce labor force and to meet the excess demand (Cherry and Moris, 2008; Tufarelli et al., 2018; Wu et al., 2022).

Alternative poultry farming and economic ımportance

The most widely farmed alternative poultry species are ducks, geese, and turkeys. The global distribution and meat production levels of these three species are in the same order (FAO, 2022). Among the most commonly raised poultry in the world, ducks rank second in the global poultry population after commercial chickens (FAO, 2022). According to FAO 2022 data, the global population of ducks is reported to be 1.109.775.000 heads (FAO, 2022). China has the largest duck population, and it ranks first in the production of duck meat, eggs, and feathers. Other countries with high duck populations include Vietnam, Bangladesh, France, Myanmar, and Ukraine. Duck farming holds significant importance in global countries for the production of meat, eggs, goose fat, and feathers. Approximately 6 million (5.968.904) tons of duck meat are produced worldwide (FAO, 2022). It is reported that around 90% of global duck meat production comes from the Pekin breed, 4% from the Muscovy breed, and 6% from other duck genotypes under farming (Thiele, 2016).

The global goose population is 358.599. 000 heads (FAO, 2022). In Asia, the countries where goose farming is widely practiced are China, Myanmar, Türkiye, Iran, and Israel. China is the dominant country in terms of global goose population. Among the countries with high goose populations outside China, Türkiye's goose population is continuously increasing. In Africa, Mozambique and Egypt, after China, are the countries with the largest goose populations. Madagascar ranks among the top ten countries globally in terms of goose population. In Europe, countries such as Poland, Hungary, France, Germany, and Romania play a significant role in the production of goose meat and related products. In some of these countries, geese are raised not only for meat production but also for the production of foie gras and feathers (FAO, 2022; Karadağ and Kırmızıbayrak, 2023).

The global market value of goose down is reported to range between 100-130 USD per kilogram. Furthermore, in European Union countries, the purchase price of goose fat is higher than that of butter (Vorona and Makarynska, 2022). The profitability of goose farming is reported to be 75%. Furthermore, goose farming may be considered a sustainable and effective method of livestock farming for addressing the deficiency of animal protein (Vorona and Makarynska, 2022). Due to the high economic value of goose meat and its products, a trend of increasing production in goose meat and its products has been observed globally. In this context, it is anticipated that the production levels of goose meat and its products will continue to rise in the coming years (Dumlu, 2024).

Foie gras, a highly sought-after and expensive product, has garnered significant attention globally. France leads in foie gras consumption, accounting for about 80% of global production and consumption. The value of foie gras is reported to range between 30-40 USD per kilogram (Guemene and Guy, 2004). The leading countries in foie gras exports are China, France, and Bulgaria, in that order. Significant production of foie gras is also carried out in countries such as Canada, Germany, and Poland. Additionally, countries like Spain, Switzerland, and Belgium are major consumers of foie gras as a popular food item. When production in these countries is insufficient, they rely on imports from other countries (Guemene and Guy, 2004; Czibolya, 2015).

Turkey populations are highest in the Americas and Europe. Among all countries, the United States ranks first in turkey production, followed by Chile, France, Poland, and Morocco (FAO, 2022). The global turkey population is 255.767.000 heads (FAO, 2022). At the country level, the highest turkey population is in the United States, accounting for 46%, followed by European Union countries with 35%. The United States

is the world's largest turkey meat producer, with a population of 70 million turkeys. Following the United States are Chile, France, Poland, and Morocco. In the United States, turkeys are not only raised for meat production but also for ceremonial purposes and decorative feather production (Sponenberg et al., 2000).

Quail, pheasant, and partridge, which are considered alternative poultry species, are significant in hunting. They provide employment opportunities and contribute to the national economies in countries where hunting is practiced as a sport (Çetin et al., 1997; Tucak et al., 2008). The purpose of raising quails varies according to countries. In Far Eastern and Asian countries, quail are primarily raised for egg production, while in Europe and the Americas, they are raised for meat production (Mlynek et al., 2016; Santhi and Kalaikannan, 2017). Although the quail population is not included in FAO statistics, literature reports indicate that China, Spain, France, and the USA are significant producers of quail meat (Minvielle, 2004). Quail eggs are more widely known and consumed than quail meat. China and Brazil are the leading producers of quail eggs, with France and Japan also ranking among the top producers (Aydın and Cengiz, 2023; Minvielle, 2004). Apart from these uses, quail meat is also featured on restaurant menus and market shelves in countries such as France, Bulgaria, Italy, Poland, Hungary, and the Czech Republic (Aktaş, 2009; Çetin et al., 1997; Koçak and Özkan, 1995; Tucak et al., 2008).

Pheasants are another alternative poultry that are widely cultivated. Pheasant breeding is carried out for hunting tourism and used as hunting material for special hunting areas. Since pheasants are a species that attracts attention with their colors and visuality, they are also raised for hobby purposes or for visual purposes in zoos. Pheasant breeding is conducted for this purpose in countries such as England, the USA, the Czech Republic, Bulgaria, and France, with a particular focus on Hungary, where professional hunting has developed into a significant sector (Aktaş, 2009; Seçim et al., 2020). In these countries, the fee charged per pheasant for hunting significantly contributes to the national economy (Aktaş, 2009; Gheta et al., 2020).

Another poultry species that is cultivated as hunting material is the guinea fowl. In addition, guinea fowl are also raised for egg production (Araujo et al., 2023; Moreki, 2009). In some West African countries, guinea fowl are the second most important source of meat and eggs after chicken (Bernacki et al., 2013). Guinea fowl breeding is intensively practiced in European Union countries such as Canada, France, Belgium, Scandinavia and Italy (Bernacki et al., 2013; Tufarelli et al., 2007). France and Russia are the leading countries where the demand for guinea fowl meat is high (Menezes et al., 2001).

The social and gastronomic cultural importance of alternative poultry

Duck meat is consumed in the cuisines of many countries, particularly in China, Southeast Asia, Thailand, France, Vietnam, and Italy, due to its tenderness and flavor, which is enhanced by various aromatic ingredients (Guemene and Guy, 2004; Nguyen et al., 2008; Zhang et al., 2020). While orange Pekin duck is very popular, duck meat is served in various ways (Julien and Marcic, 2020; Karadağ et al., 2024; Zhang et al., 2020). In European countries and Germany, fresh or canned duck meat is available on market shelves (Biswas et al., 2019; Ganesan et al., 2014; Ismoyowati and Sumarmono, 2019; Mountney, 2017). In some countries, duck tongue is a popular delicacy. In Wenzhou, a coastal city in China, duck tongue is commonly consumed as a snack, often served as an aperitif or appetizer (Cao, 2013).

Although duck eggs are not commonly consumed as table food, they are prepared and consumed in various ways in some countries. In countries such as China and those in Southeast Asia, duck egg consumption constitutes approximately 30% of total egg consumption (Ganesan et al., 2014; Ismoyowati and Sumarmono, 2019). The consumption of salted duck eggs in various forms is an ancient tradition in both China and the Philippines. In addition to salted duck eggs, pidan, which is made from the fermentation of duck eggs, is also consumed in some countries (Ganesan et al., 2014). Pidan is a foodstuff that has been known for centuries in China, Thailand, Malaysia, Singapore, South Korea, and other Southeast and East Asian countries (Ganesan and Benjakul, 2010; Ganesan et al., 2013). Additionally, in the Philippines and the USA, the street food known as Balut is a highly regarded cultural delicacy (Magat, 2002; Monleon, 2015).

Another poultry species that has gained cultural significance is the goose. The global per person consumption of goose meat has been reported to be 343 grams annually. China is the leading country in per person goose meat consumption (Vorona and Makarynska, 2022). In addition to its flavor, the optimal nutrient content of goose meat increases its demand. The seasonality of goose breeding periods and certain special occasions also influence consumption levels (Karadağ and Kırmızıbayrak, 2024). In some countries, including Korea, Germany, and Türkiye, the consumption of goose meat and other poultry is seasonal (Çullu, 2021; Gagaoua and Boudechicha, 2018;

seasonal (Çullu, 2021; Gagaoua and Boudechicha, 2018; Karadağ and Kırmızıbayrak, 2023).

Christmas goose consumption is common in Germany and Central Europe. In many countries, especially Ireland, it has become a tradition to consume goose meat during St. Martin's Day (Martinmas), which is celebrated in November (Mac Con Iomaire, 2020; Mag Fhloinn, 2007; Pingel, 2011). Goose meat is one of the essential flavors in Central European, Russian, and Italian cuisines. In some countries, it has become traditional to make sausages and other products from goose meat (Gulbaz and Kamber, 2008; Lacumin et al., 2016; Pellegrini et al., 2023).

Türkiye is one of the countries where goose meat consumption is widespread. Interest in goose breeding in Türkiye has been high in recent years, and goose meat has begun to gain recognition throughout the country. Although goose breeding is practiced in nearly every region of Türkiye, Kars province has historically been recognized as the center of goose breeding in the country. The provinces with the highest populations geese in Türkiye are Kars, Ardahan, and Muş (TÜİK, 2023; Kırmızıbayrak, 2020). Apart from these provinces, goose holds a special place in Samsun and Yozgat provinces, where goose meat is enjoyed with great enthusiasm (Kırmızıbayrak, 2002; Kırmızıbayrak, 2018). As in other countries around the world, goose meat is prepared in various ways in Türkiye.

In Türkiye, goose meat is consumed only in winter months and shows seasonality. In some provinces, dishes made with goose meat have become culturally significant and are recognized with a geographical indication (Çirişoğlu, 2022; Kırmızıbayrak et al., 2024). In Kars province, where the goose population is dense and goose meat consumption is a tradition, ‘Kars Goose Meat’ was registered with a geographical indication in 2023 (Türk Patent Kurumu, 2024). "Samsun Goose Tiridi" from Samsun province and the renowned "Arabaşı" soup from Yozgat province are among the dishes that have received geographical indications and have become important components of the culinary culture. The poultry meat used in Arabaşı soup is generally chicken, but turkey and goose are also used depending on preference (Akın and Çelen, 2020; Badem and Akturfan, 2020).

In Türkiye, traditional festivals are organized in conjunction with the consumption of goose meat. The 'Elfana' tradition, held in Balıkesir province during December and March, features goose pilaf as its main dish and has been observed for centuries. 'Traditional Goose Nights' are organized in many provinces in Türkiye. The tradition of 'Sıra Nights,' held in December and March in Samsun province, features goose meat as the main dish. Goose meat is also served at a festival held annually in İstanbul province to promote local products from Kars, Ardahan, and Iğdır (Çirişoğlu, 2022).

Ducks and geese are raised in some countries to obtain foie gras (McKenna, 2000). The production and consumption of foie gras has become a tradition in France, Hungary, Bulgaria and Israel (Guemene and Guy, 2004). However, because the production of foie gras is considered unethical from an animal welfare perspective, it is banned in Germany, Poland, Denmark, Estonia, Finland, Luxembourg, all countries in the Americas, and most Eastern European countries. Despite this, in some countries, the consumption of fatty liver has become a tradition, which helps to maintain the practice of breeding (Czibolya, 2015; Guemene and Guy, 2004). Fatty duck or goose liver is popular in countries such as France, Hungary and Israel and can be marketed at high prices. For the French, fatty liver is a traditional food (Guemene and Guy, 2004; Bonnefont et al., 2019). In the country, fatty liver is associated with various quality labels, such as traditional guarantees of quality and protected geographical indications (Bonnefont et al., 2019; Julien and Marcic, 2020). Fatty liver is consumed by 40% of the French. Two-thirds of fatty liver consumption in France is seasonal, occurring during special occasions such as Christmas and Easter (McKenna, 2000). 'Pate', a food obtained by crushing the fatty liver, has also gained a place in the culture of many countries and is consumed fondly (Czibolya, 2015; Totosaus-Sanchez, 2010).

In American culture, turkey meat dishes play a significant role in the rituals and celebrations of Thanksgiving Day, which is observed every November and has become a tradition (Karadağ et al., 2024; Kurtiş et al., 2010). On the traditional Jewish holiday of Purim, dishes made with turkey meat are a must. Turkey dishes are considered popular in Judaism (Mammadli, 2013). Turkey also has an important place in Moroccan cuisine (Gagaoua and Boudechicha, 2018). In Türkiye, Banduma, a local dish from Kastamonu province, holds significant cultural importance and is made with turkey meat (Akkuş and Şimşek, 2019; Anonim, 2024). In Türkiye, 'Bandırma Dinner' made with turkey meat in Eflani district of Karabük province is a ritual meal made on important days in the region (Ayyıldız and Yaman, 2018).

Quail meat is consumed in significant quantities in France, Italy, Spain, Greece and Hungary. In the USA, commercially raised and processed quail products are marketed through supermarkets, although in limited quantities (Panda and Singh, 1990). Quail eggs are

quantities (Panda and Singh, 1990). Quail eggs are processed and consumed in various ways. In the Philippines, a well-known street food made from quail eggs is called Kwek-kwek (Azanza, 2007). In some countries, such as India, pickled quail eggs prepared in various ways are considered a special food item. Additionally, in other countries, quail meat is used to make meatballs (Bayomy et al., 2017; Gunathilaka et al., 2021). The guinea fowl is an integral part of Brazil's cultural heritage and constitutes one of the country's most famous dishes, Capote, which is widely consumed by locals (Araujo et al., 2023).

In some countries, internal fat from poultry has become significant. Certain cuisines, notably Turkmen cuisine, have a high consumption of internal fat from poultry and game animals. The internal fat obtained from partridge, duck and geese is used in the production of most dishes (Çullu, 2021). Goose tallow has become a popular product among consumers due to its chemical composition, unsaturated fatty acid content, and its ability to be easily digested because of its low melting point. Goose fat replaces lard in Jewish cuisine (Bogenfürst, 2004) and is used in many dishes (Hugo, 1995). Goose fat was used as medicine in ancient civilizations and continues to be utilized in the health sector today (Kozak, 2021).

While the feathers and eggs of poultry farmed worldwide serve as important raw materials for many sectors, they also hold significant value due to their decorative uses (Glaveanu, 2012). In the social life and beliefs of many countries, the feathers of winged animals are used as symbols of ornamentation, strength, beauty, as well as good and bad luck (Cihad, 2021). Feathers have become an integral part of traditional clothing in some countries. Hair accessories and hats are among the oldest and most common uses of feathers (Alves, 2018; Eroğlu, 2018; Rublack, 2021). Hats decorated with peacock, pheasant, ostrich, rooster and turkey feathers are common in European countries, Brazil and Indians (Volpi, 2016). Pheasant feathers hold significant cultural value in the art, religion, social customs, and folklore of various ethnic groups in Asia. They have long been used in Chinese military uniforms (Fuller, 2000).

Around the world, peacocks are primarily raised for their visual appeal and hold a sacred place in Hindu religion (Fuller, 2015). In some African countries, guinea fowl are also significant, particularly during special occasions such as funerals and marriage ceremonies (Dei et al., 2014; Teye and Adam, 2000). Feathers from ducks and geese are an important raw material for many sectors and have become commercially important in recent years. In addition to duck feathers, goose down is utilized in the production of various products due to its lightness and unique insulation properties (Karadağ and Kırmızıbayrak, 2023; Kozak, 2021). Eggs from some species are painted and decorated in various ways, making them a common decorative item in many countries. Easter egg decorations are used in Christian communities. In Romania, decorating quail, chicken, duck, goose, and ostrich eggs is quite common and provides significant employment opportunities (Glaveanu, 2012).

Conclusion

With the growing global population, the demand for food, particularly protein sources, is increasing rapidly. In this context, poultry farming has become one of the most important agricultural production areas in the world, offering advantages such as rapid productivity. Poultry animals, with their high protein content and nutritional value, play a significant role in meeting the healthy dietary needs of humans. Moreover, with the rising health issues, poultry products' low fat content and nutritional benefits encourage healthy eating habits. In addition, poultry farming also contributes significantly to the economy. Thanks to high production efficiency and rapidly developing technology, production in this sector provides important contributions to both local and national economies in many countries. Poultry products, especially meat and eggs, have established widespread consumption patterns globally and created economic value. The sector not only creates job opportunities but also supports the development of various ancillary industries. In conclusion, poultry farming is a important sector not only for food security and healthy nutrition but also for economic development and sustainable agricultural practices. It can be stated that the importance of poultry production is increasing to meet the growing global population's nutritional needs and prevent health issues. Therefore, innovative approaches and sustainable production methods in the sector will continue to play a vital role in ensuring future food security.

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