A REVIEW OF POULTRY DEVELOPMENT MODALITY IN BHUTAN

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ABSTRACT: Poultry farming in Bhutan has undergone notable evolution, transitioning from traditional backyard systems to more commercially oriented ventures. Through an extensive review of academic literature, government reports, and grey literature sources, this study presents a comprehensive analysis of the historical evolution, current trends, challenges, and prospects of poultry development modalities in Bhutan. With reliance on agriculture for livelihoods, poultry farming in Bhutan emerges as a substantial contributor to the country's economy and food security. The transition from traditional backyard systems to more commercially oriented ventures reflects a shift toward modernization and economic diversification. These include subsistence, semi-commercial, and commercial models, each with its unique characteristics and implications for rural livelihoods and food production. Key findings highlight a steady increase in the poultry population, particularly in commercial farming, supported by government initiatives aimed at promoting entrepreneurship and investment in the sector. However, the poultry sector faces several challenges, including disease outbreaks, high feed prices, uneven market accessibility, and limited technical knowledge of poultry husbandry among farmers. Addressing these challenges requires a multi-faceted approach, including improved bio-security measures, promoting local production of feed raw materials, strengthening market linkages, and implementing training programs for farmers and extension agents. Despite these challenges, the poultry sector in Bhutan demonstrates significant potential for sustainable growth and development. Recommendations for future action include prioritizing research and innovation to improve disease resistance, production efficiency, and environmental sustainability. Moreover, there is a need for technology integration and market diversification to ensure long-term viability. In conclusion, the poultry sector in Bhutan is positioned to play a crucial role in enhancing food security, promoting economic growth, and fostering community development. However, leveraging this potential requires coordinated actions among government stakeholders, the private sector, and development partners to address existing challenges and capitalize on emerging opportunities.

Keywords: Poultry sector; development modality; market; challenges; research and innovation.

1. INTRODUCTION

Bhutan is an agrarian land-locked nation in the Himalayas, with about 57% of the population practising agriculture and livestock farming for their livelihood (Chhogyel and Kumar 2018). Poultry farming systems in Bhutan are mainly situated in wet, humid, and dry subtropical regions (National Statistics Bureau [NSB] 2022). Currently, Bhutanese farmers rear six different types of livestock species such as poultry, bovine, equine, caprine, ovine and swine. Among these, poultry farming holds the highest population with 0.975 million birds (NSB 2022).

Livestock rearing, particularly dairy and poultry farming, indeed remains a major activity for farmers in Bhutan (World Bank 2017). Poultry farming in Bhutan has evolved

from traditional backyard systems to more commercially oriented ventures (Gyeltshen 2011). Early studies, such as the one conducted by Nidup et al. (2005), provide insights into the historical context of poultry rearing in Bhutan. The author outlines the shift from subsistence farming to a more organized and sustainable poultry sector. Research by Penjor and Chhetri (2019) underscores the pivotal role of poultry farming in improving livelihoods, particularly within rural communities. Poultry rearing has provided employment opportunities and a source of income to numerous households in Bhutan, contributing to poverty reduction (Nidup and Tshering 2007). Further, studies including Gyeltshen (2011), have examined the impact of introducing poultry products on diversifying diets and improving nutritional intake in Bhutan. Poultry meat and eggs have become important sources of essential nutrients, especially for children and pregnant women (Penjor and Chhetri 2019).

Research conducted by Chhetri and Tashi (2022) has highlighted various challenges faced by the poultry sector in Bhutan, complemented by additional challenges reported in print media by Quendren (2023). These challenges include disease outbreaks, inadequate infrastructure, and limited access to quality inputs and markets. Understanding and addressing these challenges is crucial for sustainable development. The Royal Government of Bhutan (RGoB) has implemented various policies and initiatives to support the development of the poultry sector.

The poultry sector in Bhutan has the potential to access export markets, and the Ministry of Economic Affairs assesses market opportunities for Bhutanese poultry products at both regional and international levels, highlighting the prospects for economic growth (Ministry of Economic Affairs [MoEA 2020]). Gender dynamics within poultry farming are a critical aspect of development. The Food and Agriculture Organization of the United Nations (FAO) has examined the role of women in poultry farming and their contributions to household income, providing insight into this important dimension (FAO 2023). The adoption of modern technology and innovations in poultry farming has been the subject of research. Hossain et al. (2021) investigated that technology transfer and capacity building had a positive impact on poultry productivity and income generation. Introduction of innovative poultry technologies can substantially improve efficiency, productivity, and sustainability. However, further research is essential to assess suitability, economic viability, environmental impact, safety, training needs, and regulatory compliance before widespread implementation. Therefore, this review aims to explore the historical evolution, current trends, challenges, and prospects of poultry development modalities in Bhutan. It seeks to provide a comprehensive understanding of how poultry farming has evolved over time, the current state of the sector, the obstacles it faces, and the potential opportunities for its sustainable growth and development.

2. MATERIALS AND METHODS

To review the poultry development modality in Bhutan, an extensive search was conducted covering academic databases, digital libraries, and official government publications. The search phrases used included "poultry development in Bhutan", "poultry farming modalities", and "Bhutan agriculture policies". Both peer-reviewed journals and grey literature sources were

consulted to ensure a comprehensive coverage of relevant documents.

The selection of literature and documents for this review was guided by specific inclusion and exclusion criteria. Documents lacking relevance and those about livestock species other than avian were excluded. Inclusion criteria encompassed documents related to poultry development in Bhutan, such as research articles, government reports, policy documents, and case studies. A total of nine international papers, 26 national papers, one international news report, three national print media news, one personal communication. Additionally, data were retrieved from the DoL and NSB data repositories.

3. RESULTS AND DISCUSSION

3.1 The First Poultry Development Project in Bhutan

Bhutan follows a five-year development plan (GNHC 2019). The RGoB introduced poultry development activities in late 1961, aligning with the country's first five-year plan. The primary objective was to improve the nutritional well-being of the rural communities and to alleviate poverty through increased egg and chicken production (Nidup et al. 2005).

3.2 Poultry population trend in Bhutan

According to the DoL (2006-2020) and NSB (2021-2022), the poultry population in the country has increased over the years (Figure 3.1). Nevertheless, in 2022, a notable decline was recorded. According to Jamtsho (2020), the decline was due to the disruption of parent stock [PS] import which affected the production and supply of day-old chicks [DoCs] to the poultry farmers in the country. As per the National Poultry Development Center [NPDC] (NPDC 2023), the country had 670 operational commercial layer farms and 258 operational commercial broiler farms. NSB (2022) reported that the livestock sector, inclusive of poultry, contributed 5.25% to the Gross Domestic Production [GDP].

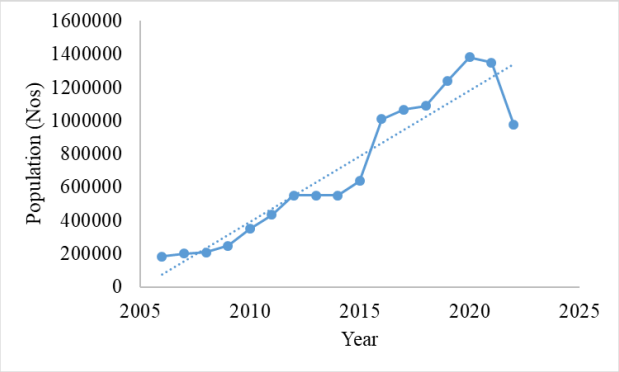

Figure 3.1: Graph showing poultry population trend in Bhutan, between 2006 and 2022.

3.3 Poultry Development Approaches in Bhutan

The poultry development approaches starting from the first five-year plan to the twelfth five-year plan, involved different development modality approaches aimed at fostering development in subsequent five-year plans. The introduction of Rhode Island Red [RIR] and Australorp poultry breeds from India in 1961 was aimed at enhancing production through selective breeding, producing chicken lines that yield more chicken meat and eggs. The RIR PS was introduced mainly to improve domestic chicken and egg production (Nidup et al. 2005). In 1999, a trial was conducted to assess the impact of introducing the RIR PS in village conditions by importing PS hatching eggs from the Netherlands (Nidup et al. 2005). To enhance domestic chicken and egg production even more, other exotic poultry breeds such as White Leghorn and

Bovans Brown in the early eighties were introduced (DoA 2002).

Additionally, in 1984 the country provided improved cockerels for crossbreeding with local poultry breeds, indicating efforts to enhance genetic diversity and productivity. Notably, there was a time when the government planned to replace indigenous chicken breeds entirely with exotic and improved ones. While these initiatives may have sought to improve productivity and genetic traits, they also raise concerns about potential impacts on local breeds, biodiversity, and cultural heritage associated with indigenous poultry populations. Balancing the introduction of new breeds for productivity gains with the preservation of local genetic resources and cultural traditions is crucial for sustainable poultry development in Bhutan (Nidup et al. 2005). Another development strategy besides the introduction of foreign poultry breeds was the establishment of government-owned poultry farms (Nidup et al. 2005; SAPPLPP 2009; Yuden 2022).

In Bhutan, a commercial broiler farming venture was initiated in 2004 (Tashi 2009). In 2009, the NPDC was established in Sarpang. The primary mandate of NPDC was to import layer and broiler PS, breed them, and supply the resulting DoCs to poultry farmers. In 2009, Broiler PS was introduced from India and bred at the National Poultry Development Center [NPDC]. The resulting commercial DoCs were supplied to farmers in the field. Similarly, Hy-line Brown PS was introduced from Australia, and bred at NPDC. The Hy-line Brown PS was imported from New Zealand and bred at the Regional Pig and Poultry Breeding Centre [RPPBC], Lingmethang and Regional Poultry Breeding Centre [RPBC], Paro and resulting DoCs were supplied to farmers in the field (NPDC 2020). In 2016, Hy-line Silver Brown PS was

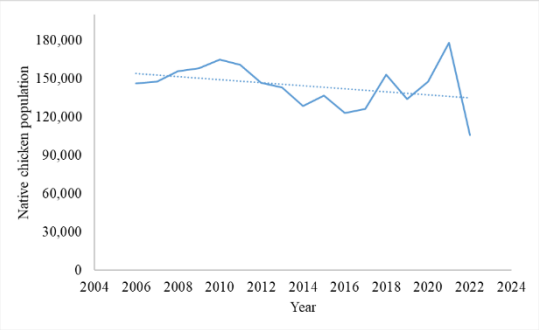

Figure 3.2: Graph showing native chicken population trend in Bhutan.

introduced, and commercial DoCs were supplied to farmers. The Bovan Brown PS was reintroduced by importing from India in 2020, and breeding is being carried out at three government farms such as NPDC, RPBC and RPPBC for commercial DoC production and distribution to poultry farmers in the country. Similarly, Ross 308 Broiler PS is also bred at NPDC for DoC production and distribution to farmers (NPDC 2020).

In 2016, the Bhutan Livestock Development Corporation Limited [BLDCL] was instituted with the mandate to improve market outlets for all livestock and processed agricultural goods, produce broiler DoCs, assist in domestic animal feed production, facilitate the import of feed and feed ingredients for domestic animal feed producers, lead post-production of livestock products, provide support services to the livestock contract farmers of BLDCL and facilitate collaboration between BLDCL and the school, hospital and other institutional feeding programs in the country (NPDC, 2016).

3.3.1 Turkey Production and Development

Turkey (*Meleagris gallapavo*) breeds such as American Bronze and Beltsville Small White was introduced from Thailand to the poultry farming system under Sarpang Dzongkhag in Bhutan, situated at an elevation of 300 meters

above sea level [masl] (NPDC 2020). According to NPDC (2020), a total of 2,164 Turkeys were recorded in the area in 2020. The rural communities of Sarpang and Tsirang districts adopted Turkeys in their poultry farming system.

3.3.2 Native Chicken Production and Conservation

Figure 3.2 shows the native chicken population in Bhutan from 2006 to 2022. The increasing native chicken population trend was recorded until 2021. However, in 2022 decline in the native chicken population by 40.6% was recorded compared to the year 2021 (NSB 2022). The introduction of exotic chicken breeds that are favoured for their higher productivity and growth rates has led to a decline in the native chicken population. Farmers prefer exotic breeds due to perceived advantages in terms of meat or egg production (MoA 2002; Milkias 2016). Shifts in agricultural practices, such as increased mechanization, changes in land use patterns, and urbanization have resulted in habitat loss (Ramankutty et al. 2018), and reduced opportunities for traditional free-range poultry rearing, affecting native chicken populations. Crossbreeding programs aimed at improving the productivity of native chicken breeds through crossbreeding with exotic breeds may have resulted in the dilution of pure native chicken populations. While crossbreeding can enhance certain traits, it may also lead to the loss of unique genetic characteristics of native chicken breeds (Fulla 2022). As of the year 2000, the native poultry population comprised over 95% of the national poultry population (MoA 2002). Native poultry breeds are well adapted to the harsh local environments (Wangmo 2022). Therefore, recognizing the importance of native chickens in terms of adaptation and local importance, the RGoB established the Yubja (native chicken) Breeding and Conservation Center in 2017 in eastern Bhutan at Shertsam, Lhuentse (Namgyal 2020; Namgayel 2022). Currently, Bhutan has 10 chicken breeds such as *Barred Yubja, Baylaitey, Belochem, Bobthra, Kauray, Naked Neck, Pulom, Shekheni, Yuebja Naap,* and *Yuebja Kaap*, and all these chicken breeds are on the list of the FAO Domestic Animal Diversity Information System [DAD-IS] (FAO 2023). The conservation of the native chicken population is being led by the National Biodiversity Centre [NBC], mandated to coordinate and implement biodiversity conservation efforts in the country.

3.4 Different poultry farming scale

Poultry farming in Bhutan operates at different scales, ranging from backyard and subsistence to semi-commercial and large-scale commercial farming. The definition of each poultry farming category in the Bhutanese context is as follows: (1) Subsistence farming refers to farms with a stocking capacity of ≤500 birds. (2) Semi-commercial farming refers to farms with a stocking capacity ranging between 501 to 1000 birds. (3) Commercial farming means those farms with a stocking capacity of > 1001 birds (NPDC 2024).

3.4.1 Subsistence Poultry Farming

In Bhutan, 160 layer and 48 broiler subsistence farms were recorded (NPDC 2023). Backyard poultry farming is the most common modality in Bhutan, practised by both rural and urban households. Backyard

poultry rearing is crucial for ensuring food security and supplemental income to numerous families. It continues to play a vital role in Bhutan's economy, especially in rural areas where agriculture is the primary source of livelihood (Gyeltshen 2011). By engaging in backyard poultry rearing, households can meet their daily protein requirements and earn additional income through the sale of eggs and poultry meat.

3.4.2 Semi-commercial Poultry Farming

A total of 145 layer and 71 broiler semi-commercial farms were recorded in 2023 (NPDC 2023). Semi-commercial poultry farming contributes to rural livelihoods and economic development by providing a source of income for small-scale farmers. A study by Tashi (2009) suggests that semi-commercial poultry enterprises generate higher incomes compared to subsistence farming, as surplus poultry products are sold in local markets and towns nearby. This additional income contributes to poverty reduction and improves the overall economic well-being of rural households.

3.4.3 Commercial Poultry Farming

In 2023, a total of 230 layer and 65 commercial broiler farms were recorded (NPDC 2023). In recent years, commercial poultry farming has gained popularity in Bhutan due to support initiatives. The RGoB through the Ministry of Agriculture and Forests [MoAF] has introduced various support schemes to promote commercial poultry farming in the country. These initiatives range from providing subsidized loans to technical assistance and capacity-building programs, all aimed at encouraging and assisting aspiring poultry entrepreneurs. Research by Jamtsho et al. (2021) highlights the economic significance of commercial poultry enterprises, demonstrating their contribution of an average net profit to poultry stakeholders through commercial farming of 1083 birds, accounting for a 24% profitability ratio.

3.5 Challenges linked to poultry farming

Despite the increasing interest in poultry farming, Bhutan faces various challenges in the poultry development modalities as follows:

3.5.1 Poultry Disease Outbreaks

Poultry diseases such as avian influenza and Newcastle disease pose a significant threat to the poultry sector, with frequent outbreaks leading to the culling of birds, and subsequent financial losses for farmers. According to Lungten et al. (2022), maintaining farm bio-security and implementing the best poultry management practices are vital for preventing and controlling Newcastle disease in poultry farms. Furthermore, according to the study carried out by Nidup and Tshering (2007), having a contingency plan that includes preventive measures for the outbreak of highly pathogenic avian influenza [HPAI] and emergency response plans is important to respond to the outbreak. The authors recommend that these plans must be reinforced and regularly updated.

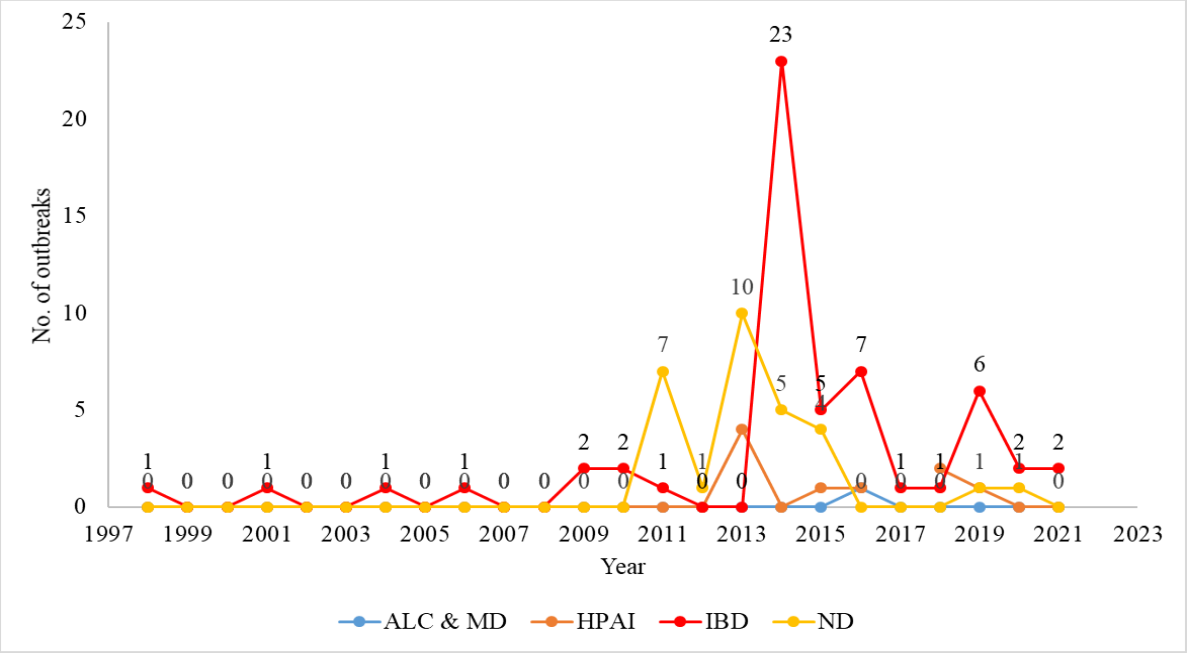

Figure 3.3: Graph showing the trend of notifiable disease outbreaks in Bhutan.

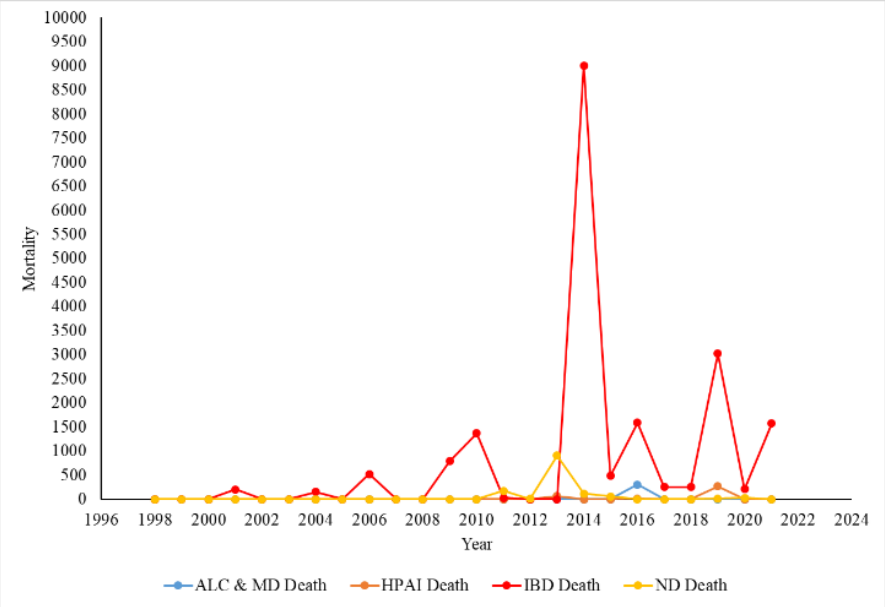

Figure 3.4: Graph showing the mortality trend of chicken.

Between 1998 and 2021, a total of 95 notifiable poultry disease outbreaks occurred in Bhutan (figure 3.3). As such the diseases include Avian Leucosis Complex [ALC] & Marek's Disease [MD] (n=1), Highly Pathogenic Avian Influenza [HPAI] (n=9), Infectious Bursal Disease [IBD]: (n= 56), Newcastle Disease [ND] (n= 29). As per the record maintained by the National Center for Animal Health [NCAH], 21,402 poultry mortalities were recorded during these notifiable disease outbreak outbreaks (Figure 3.4).

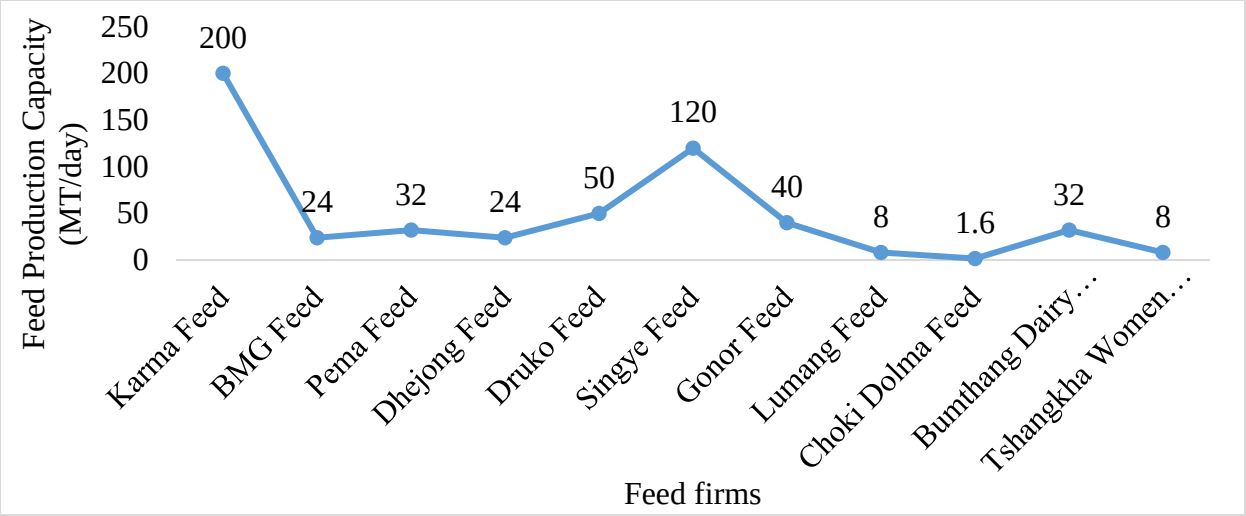

Figure 3.5: Graph showing animal feed firms with production capacity per day.

3.5.2 Poultry Feeds

Bhutan heavily depends on imported poultry feed ingredients, exposing the poultry sector to price fluctuations and supply disruptions. Developing a sustainable and cost-effective feed production system within the country is essential for the growth of the poultry sector. According to Wangchuk and Dorji (2008), the import of animal feed is expected to increase annually due to the upscaling of livestock farming. To meet the growing demand for animal feed, the strengthening of existing animal feed mills (Figure 3.5) is recommended. Furthermore, growing of feed ingredients internally or exploration and growing of alternative feed ingredients is recommended.

In Bhutan, there are 11 feed firms with an overall production capacity of 539.6MT of animal feed per day. Of that, the Karma Feed has the largest production capacity (200MT/day) and Choki Dolma Feed has the lowest production capacity (1.6 MT/day). The feed mills are located in eight Dzongkhags. The BMG Feed and Gonor Feed in Sarpang, Pema Feed, Lumang Feed and Choki Dolma Feed in Trashigang, Dhejong Feed in Wangdue Phodrang, Druko Feed in Tsirang, Karma Feed and Singye Feed in Chhukha, Bumthang Dairy Cooperative Feed in Bumthang, and Tshangkha Women Group Feed in Trongsa. Majority of these feed mills do not operate at their full production capacity due to inadequate feed ingredients and low demand for feeds in the country (GM Rizal and S Wangchuk, personal communication, March 12, 2024).

3.5.3 Market Challenges

Access to markets and price fluctuations pose challenges for poultry farmers, especially those in remote areas. The government needs to focus on improving market linkages between different institutions and regions within the country and ensuring price stability for poultry products like chicken and eggs. According to a study carried out by Wangchuk and Dorji (2008), the marketing of livestock produce has been streamlined through the formation of farmers' groups and cooperatives, making it easier to sell their products. Furthermore, a study by Dorji and Gyelpo (2022) identified key challenges faced by these groups and cooperatives, which were the inadequate connections and collaboration with institutions and firms for the eggs and chicken market. Therefore, government support in establishing linkages

for these groups and cooperatives will play a vital role in expanding reliable market access for eggs and chicken.

3.5.4 Technical Know-how on Poultry Farming

Poultry farming requires a combination of knowledge, skills, and management practices to ensure success (FAO 2013). While many poultry farmers possess a basic understanding of traditional poultry farming methods, there are often challenges or inadequacies in their knowledge and skills, particularly regarding modern poultry farming practices (Alders et al. 2018).

Capacity building through training programs for interested poultry farmers to improve their production and management practices are vital (Gaylal and Nedup 2023). As highlighted in studies by Pradhan and Chhetri (2022); Rinzin and Sonam (2022), training in various farming activities, such as poultry and dairy farming plays a crucial role in making farmers successful in agri-business in Bhutan. By empowering poultry farmers with the necessary knowledge and skills, they can enhance their productivity, profitability, and sustainability in the long term.

3.6 Potential for Sustainable Growth in the Poultry Sector

3.6.1 Research and Innovation

The poultry sector in Bhutan has the potential for sustainable growth and development and presents a promising avenue for sustainable growth that combines economic viability (Dendup et al. 2023). Investment in research and technology adoption is important to improve production efficiency, farm biosecurity, poultry breeds, and disease resistance (Hoffmann 2005). Poultry farming is segmented into subsistence, semi-commercial and commercial categories with an open housing system equipped with simple feeders and drinkers (NPDC 2012). In this regard, exploring digital poultry farming through research and technology adoption such as Aviary Poultry Farming System suitability in Bhutan is important.

Aviary systems comprise multi-tier structures situated above a littered floor, incorporating provisions such as nests, feeders, waterers, perches, and welfare enrichments. Feeders are typically organized to allocate across certain levels, while nests and waterers are situated on others. The ground level is often designated for controlled chick brooding. The littered floor area should encompass over 30% of the usable space within the aviary, accounting for slat floors but excluding nests. The highest tier is usually designated for bird resting or sleeping purposes, allowing for an increased bird capacity within a structure (Hy-line 2016). However, to achieve sustainable poultry development, it is important to provide continuous education and training for poultry farmers and invest in poultry research and innovation (Pradhan and Chhetri 2022).

4. CONCLUSIONS AND RECOMMENDATIONS

The poultry production in Bhutan experiences rapid growth, particularly in exotic layer and chicken production. The poultry sector has shown to be an attractive investment option with fast returns leading to an annual increase in the poultry population. Due to the increasing poultry population, the surveillance of poultry disease is important. The evolution of poultry development modalities in Bhutan from traditional backyard farming to a mix of backyard, commercial, and community-based models illustrate the sector's dynamic nature.

While these modalities offer increased potential in terms of food production, income generation, and community development, they also present challenges such as disease management, market access, and

sustainability. Choosing the most appropriate model depends on various factors such as available resources, technical know-how, market demand, and socio-economic context. Moreover, environmental concerns related to poultry farming must be addressed through concerted efforts from the government, private sector, and development partners. Climate smart poultry farming like adoption of poultry aviary systems in the field would not only improve egg and chicken production, but also address environmental concerns. In general, the poultry sector in Bhutan should continue to thrive and contribute to the food security and economic well-being of Bhutanese. Investment in research, innovation and sustainable practices holds a high priority in realizing the full potential of the poultry sector in Bhutan.

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