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VALUE CHAIN ANALYSIS OF BROILER POULTRY PRODUCTION IN SINDHULI DISTRICT, NEPAL

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ABSTRACT

Poultry farming plays a crucial role in the economic and nutritional security of Nepal, with broiler production serving as a significant component of this sector. However, the broiler poultry value chain in Sindhuli District faces various challenges, including inefficiencies in production and marketing. This study aimed to analyze the value chain of broiler poultry production in Sindhuli District to identify key processes, challenges, and opportunities for improvement. The study was carried out during May-September 2023 through questionnaire format. Out of 55 respondents, 40 broiler poultry farms, 1 hatchery (broilers), 2 agro-vets and 10 retailers were surveyed where 5 core processes (input supply, production, collection, marketing, and consumption) were identified. Among the poultry farmers, 63% were male and 37% females. This study revealed a strong correlation between age and experience, emphasizing the pivotal role of experience in poultry farming. Educational backgrounds varied widely, with 27% respondents having only elementary education and only 3% respondents having attained a University-level education. Farm registration patterns followed distinct peaks in 2074, 2076, and 2077, reflecting the evolving landscape of poultry farming. Small-scale poultry operations, managing 500-1000 birds, dominated the sector. The intensive deep litter housing systems were found to be adopted by 100% of broiler framers at different scale and there was reliance on commercial feeds from sources outside the district. The respondents exhibited responsible antibiotic usage, with 90% farmers administering antibiotics therapeutically. A total of 70% farmers reported disease incidences on their farms, with Colibacillosis, Chronic Respiratory Disease (CRD), Infectious Bursal Disease (IBD), Newcastle Disease (ND), and Mycotoxicosis being the most encountered issues. This study identified challenges such as limited disease preparedness and biosecurity measures, small-scale poultry farming, restricted financial resources and opportunities for enhanced training, improving marketing channels and greater adoption of biosecurity practices.

Keywords: Commercial broiler, input supply, marketing channels, Sindhuli, value chain

INTRODUCTION

Nepal stands as a predominantly agricultural nation, with the agricultural sector constituting 23.9% of its GDP and employing 60.4% of the total population (MoF, 2022). Livestock, including cattle, buffalo, goats, sheep, poultry, and pigs, collectively contribute around 11.5% of the total GDP (FAO, 2006; MoALD, 2017). The poultry industry independently contributes 4% to the overall GDP (FAO, 2014a; MoALD, 2020) and 8% to the agricultural GDP, showcasing its significant role in the country's economy.

Globally, Nepal holds the 92nd position in egg production and ranks 112th in poultry meat production. (FAO, 2014a; Singh, 2018), highlighting the poultry sector as an emerging agribusiness and a vital source of the cheapest animal protein. Nepal has witnessed significant growth in poultry investments and the market supply chain, resulting in the widespread accessibility of poultry meat and eggs in local markets nationwide. (CBS, 2016).The poultry industry has created employment opportunities for over 150,000 individuals while attracting investments of approximately Rs. 115 billion (US$1.1 billion) (CBS, 2016; MoALD, 2020). Modern farming practices have driven sectoral growth, with improved breeds introduced in 1959 marking a turning point for Nepal's poultry farming. Today, there are over 1,400 commercial layer farms and more than 20,000 commercial broiler farms, ensuring poultry products' availability in local markets across Nepal (CBS, 2016; FAO, 2014a).

In 2021, Nepal declared self-sufficiency in egg and meat production, with poultry dominating the animal protein supply chain. Chickens account for 99% of poultry meat and egg production, yielding approximately 1.61 billion eggs and 548,000 tons of meat annually (Prasain, 2021). In the year 2021/2022, the national fowl population exceeded 66 million, with Sindhuli District contributing over 1 million fowls, producing 3,540 metric tons of chicken meat and 8.3 million eggs (MoALD, 2023). Research on Nepal's poultry value chain highlights challenges such as limited market access, weak biosecurity measures, inadequate disease surveillance, and gender disparities in agricultural participation, alongside findings that smallholder farmers face barriers like poor technology access and insufficient veterinary services. Additionally, studies emphasize the need for vertical integration, better regulatory compliance, and increased productivity to address low per capita poultry consumption and improve efficiency and sustainability in the sector.

Poultry value chain studies in Nepal

Prior research has explored various aspects of the poultry value chain in Nepal, providing valuable insights into the industry. For instance, a study by Pant *et al*., (2017) examined the challenges faced by smallholder poultry farmers in Nepal, emphasizing the need for improved access to markets, technology, and veterinary services. Similarly, Dhakal *et al*., (2019) conducted a value chain analysis of the broiler industry in Nepal, highlighting the importance of vertical integration and contract farming in enhancing efficiency and quality control. Osti *et al*., (2017) in his study illustrated a significant statistical difference ($P<0.05$) in farmers' age and experience. A study by FAO ECTAD (2020) revealed that the poultry value chain in Nepal is intricately complex due to various factors, including traditional practices, socio-economic conditions, geographical features of the districts, and extensive open borders with neighboring countries, particularly India. In the study, several critical findings emerged. A study of Gompo, *et al*. (2019)aimed to identify the top ten poultry diseases in Nepal. The top ten diseases with highest to lowest incidence were: colibacillosis 26%.

The poultry industry in Nepal presents a unique challenge: per capita consumption of chicken meat and eggs significantly lags behind the global average, with Nepalese consumption at 5.7 kg chicken meat and 3.66 kg (i.e., around 61) eggs per year compared to the global averages of 14.1 kg meat and 8.9 kg eggs (Mottet & Tempio, 2017; Singh, 2018). The reviewed studies align closely with our findings.

MATERIALS AND METHODS

Selection of study area

This study was carried out in May 2023 in Kamalamai Municipality, the district headquarters of Sindhuli district. It covers an area of 482.57 sq. km and consists of 14 wards. It is situated in the center of the district. It borders Tinpatan municipality in the east, Marin municipality in the west, Golanjor, Sunkoshi & Ghanglekh municipalities in the north, and Mahottari district in the South at present (VHLSEC,2021). Out of the 14 wards in the Kamalamai municipality, two (ward#4, ward#5) were the major broiler poultry producing wards. So, these two wards were selected for the household survey for this study..

Sampling procedure and sample size

In the context of this research, a meticulous approach was undertaken to ensure the comprehensive representation of all relevant stakeholders within the poultry value chain. Recognizing every actor's pivotal role in this intricate network; a deliberate and systematic sampling strategy was employed. Simultaneously, recognizing the limited numbers of certain key stakeholders, a different approach was adopted. Actors such as hatchery operators, input suppliers, distributors, and

retailers, although fewer in number compared to farmers, were no less significant in the value chain. To encompass their perspectives, a snowball sampling technique was applied.

Firstly, to capture the diversity and nuances within different administrative units, a judicious decision was made to include all actors associated with the poultry value chain. This inclusive stance was critical as it allowed for a holistic understanding of the dynamics at play. The study population consisted of all registered poultry farmers within the administrative units under study, totaling approximately forty-eight broiler poultry farms and a single hatchery . A subset of twenty poultry farmers was meticulously chosen from each administrative unit. This methodical selection process ensured that a substantial cross-section of the farming community was represented, ultimately totaling forty poultry farmers. The selection of these farmers was purposive, a decision rooted in the pragmatic realm of convenience. Purposive sampling was used to select farmers actively engaged in broiler production and willing to participate in the study. Although this method introduces potential bias, it was chosen due to logistical constraints and the need to gather data from knowledgeable respondents

1.1 Table 1. Types of key informants interviewed

SN.	**Stakeholders of the value chain**	**Sample selection**
1.	Poultry Farmers	40
2.	Hatchery Operators	1
3.	Input Suppliers	2
4.	Distributors	2
5.	Retailers	10

Sources of data

Primary data were gathered through the utilization of semi-structured questionnaires that were tailored to the research objectives. This involved conducting in-depth interviews with various stakeholders in the poultry value chain. These surveys aimed to gather quantitative data on resource flow, value addition, and challenges faced by each stakeholder.

Questionnaire Survey

Surveys were conducted among various stakeholders in the poultry value chain, including poultry farmers, hatchery operators, input suppliers, distributors, and

retailers using a semi structured questionnaire. These surveys aimed to gather quantitative data on resource flow, value addition, and challenges faced by each stakeholder.

Key informants

In-depth interviews were conducted with key informants, including representatives from local government agencies, agricultural cooperatives, and poultry industry associations. These interviews provided qualitative insights into the challenges and opportunities within the value chain.

Public interaction: Increasing the communications with new people, more or less information and data were collected.

Secondary data collection: Secondary data were obtained from various sources, including published and unpublished books, journals, newspapers, research papers, magazines, annual publications, reports, and related documents published by MoALD, VHLSEC, CBS, etc. These secondary sources were referred to in order to supplement and corroborate the primary data collected through the interviews.

Analysis and interpretation of data

The data analysis and interpretation activity were followed after the completion of field works. The collected data were analyzed using a combination of quantitative and qualitative methods. Quantitative data were analyzed using statistical software to calculate descriptive statistics, while qualitative data were subjected to content analysis to identify recurring themes and patterns.

RESULTS AND DISCUSSION

Marketing Channel of broiler poultry in Kamalamai municipality

In the study area, the research identified five distinct marketing channels. Notably, a significant role was played by agro-vets, who functioned as versatile market actors. These agro-vets often served as input suppliers, distributors, and even traders in numerous cases, demonstrating their multifaceted involvement in the poultry industry.

Parent Stock Farms → Hatchery (DOCs) → Distributors → Producers → Wholesalers → Retailers → Consumers
Farmers Participating in this Channel: 10 farmers (25%)
Product Flow through this Channel: 35% (30% of the total broiler production)
Producers → Wholesalers → Retailers → Consumers

Farmers Participating in this Channel: 14 farmers (35%)
Product Flow through this Channel: 30% (30% of the total broiler production)

Hatchery (DOCs) → Producers → Distributors → Wholesalers → Consumers

Farmers Participating in this Channel: 6 farmers (15%)
Product Flow through this Channel: 20% (20% of the total broiler production)

Producers → Retailers → Consumers

Farmers Participating in this Channel: 4 farmers (10%)
Product Flow through this Channel: 5% (5% of the total broiler production)

Producers → Consumers

Farmers Participating in this Channel: 6 farmers (15%)
Product Flow through this Channel: 10% (10% of the total broiler production)

Most Efficient Channel (as per respondents): Producers → Wholesalers → Retailers → Consumers

Farmers Participating: 14 farmers (35%)
Product Flow: 30%

Most Dominant Channel: Parent Stock Farms → Hatchery (DOCs) → Distributors → Producers → Wholesalers → Retailers → Consumers

Farmers Participating: 10 farmers (25%)
Product Flow: 35%

Value Chain map of broiler poultry in Kamalamai municipality

Value chain mapping for broilers involves creating a visual representation of the connections between different participants and enterprises within the value chain. This map illustrates the flow of broilers from producers (farmers) to end consumers and demonstrates the relationships among various stakeholders in the broiler industry in graphical form. The accompanying figure (figure 81) depicts the primary actors in the Broiler Value Chain (BVC). According to the figure, the

five key actors are input supply, production, collectors, marketing, and consumers. This finding aligns with the findings of Oloso *et al*., (2019) and with FAO. Additionally, these primary actors receive essential support services from feed suppliers, veterinary professionals, hatchery operators, and processing plant suppliers, all of which are also indicated on the map (Figure 1).

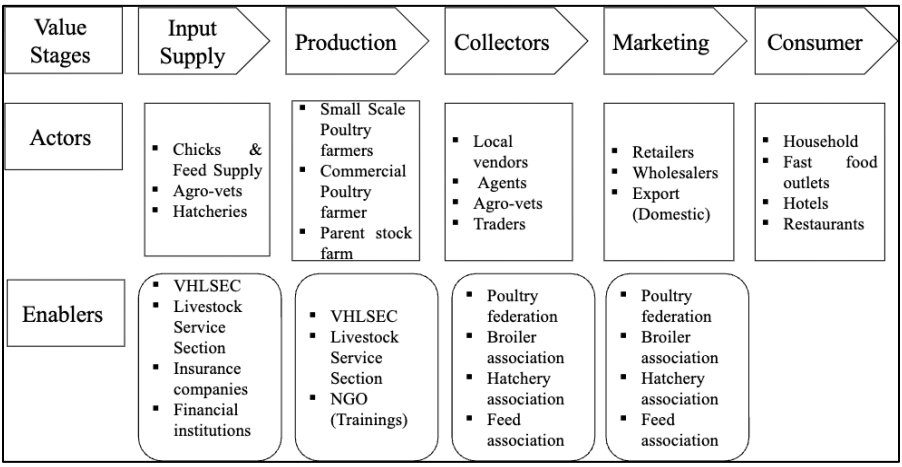

Figure 1. Value chain map of broiler poultry in Sindhuli district

Input supplier: Input suppliers are the individuals or institutions, responsible for provisioning producers with essential resources such as day-old chicks, vaccines, medicines, feeds, and essential equipment for chick rearing. In Sindhuli, agro-vets serve as primary sources for a range of these inputs. In larger-scale operations, hatchery dealers and feed industry distributors play pivotal roles in the supply of chicks and feed, respectively.

Producers:

Parent stock farmer

In Sindhuli District, the Singul hatchery and parent stock farm follow a specific process. They obtain Parent Stock Day-Old Chicks (PS DOCs) from GPS (Grandparent Stock) farms or import nationally and internationally. Additionally, they procure essential items like feed, feed ingredients, feeders, drinkers, medications, vaccines, and other inputs from their suppliers. The parent DOCs are raised for approximately 1.5 years under the supervision of a veterinary doctor and eggs are transferred weekly to the hatchery for a 21-day incubation period. Subsequently, the resulting commercial Day-Old Chicks (DOCs) are exclusively distributed to local commercial farmers, and DOC distributors within the district and exported to Kathmandu.

Commercial broiler farmers

The farmers procure commercial Day-Old Chicks (DOCs) from local hatcheries or distributors. Similar to Parent Stock (PS) farmers, they also source various inputs. The broiler birds undergo a growth period lasting approximately 42-46 days, during which they attain an average weight of 2 kg or above. This rearing process may or may not involve the supervision of a Veterinary Doctor. Subsequently, the mature broiler birds are either collected by distributors or directly sold to local consumers, live broiler marketers, wholesalers, or retailers.

Collectors: The collectors, encompassing agro-vets, local vendors, commission agents, and traders, serve as critical intermediaries. The two major agro-vets of the district supply essential inputs like day-old chicks and medicines while offering technical guidance to the majority of the farms as well as collecting the mature live birds to sell off in the markets. Local vendors act as points of sale for live birds and eggs, connecting producers with local consumers. Commission agents facilitate transactions between farmers and buyers, ensuring fair market value. Traders expand the reach of Sindhuli's poultry products beyond the district, transporting them to regional and national markets. Collectively, these collectors streamline the flow of resources and products, contributing significantly to the district's poultry industry's sustainability and growth.

Marketing: In the poultry value chain of Sindhuli District, marketing is facilitated by wholesalers and retailers. Wholesalers procure, process, and distribute poultry products, serving both local and broader regional markets. They efficiently handle bulk quantities, ensuring a steady supply of poultry products in the district.
Retailers, operating at the local levels, directly connect producers with consumers by offering a diverse range of fresh poultry products. They play a vital role in food security and cater to specific consumer preferences. Collectively, wholesalers and retailers bridge the gap between producers and consumers, ensuring the economic sustainability of the poultry value chain and contributing significantly to local food security.

Processors: The category of meat processors is characterized by a limited number of participants, and it was observed that the majority of birds were supplied directly to consumers without undergoing any processing functions that enhance the product's farm utility. Retailers took on the responsibility of slaughtering, cleaning, and packaging the birds before selling them to consumers. Notably, the Sinhuli District lacked dedicated processing agents within its poultry value chain.

Consumers: Consumers, encompassing households, hotels, and restaurants, play a pivotal role in the poultry value chain of Sindhuli District. They typically procure fresh broiler meat from local markets, retailers, and fresh houses. Broiler meat, due to its affordability and favored taste, constitutes a significant portion of their consumption, serving as a key protein source in the local diet. Additionally, hotels and restaurants regularly source poultry products to meet the demands of their patrons, further stimulating the poultry market. Overall, consumers play a central role in shaping demand patterns and influencing the dynamics of the local poultry industry.

Enablers: Enablers or facilitators, including both agencies and individuals, provide support and assistance to actors from input supply to consumption, focusing on enhancing product value rather than directly adding value to the products themselves. They are government sectors, poultry federations, VHLSEC, NGOs, and related organizations integral to the poultry value chain in Sindhuli District. They actively contribute to policy formulation, disease control, advocacy, training, and knowledge dissemination. Government sectors regulate and support the industry, while poultry federations foster cooperation among stakeholders. VHLSEC ensures poultry health, and NGOs empower smallholder farmers through capacity building. These enablers collectively create an environment conducive to the growth and sustainability of the local poultry sector.

Range of value-added available poultry products

In the scenario of Sindhuli District, Nepal, where meat processors are absent, the poultry value chain predominantly offers value-added products through fresh houses. These fresh houses undertake critical functions such as slaughtering, dressing, and preparing chicken meat for sale in local markets. The packaged value-added products such as sausages and meatballs are imported from Kathmandu and found in few marts and shops.

Among the value-added products in this context:

- Chicken Cuts: Various cuts of chicken, including thigh pieces and wings, are processed and made available for local consumption, with hotels and restaurants being major consumers.
- Chicken Organs: Various poultry organs, such as gizzards, livers, and hearts, are popular among local households. These organ meats are valued for their unique flavors and are used in traditional and contemporary Nepali dishes.
- Chicken Legs and Bones: Chicken legs and bones are often preferred by households with dogs as pets. These parts provide a source of protein

and nutrition for pets in cheap; minimizing waste in the poultry value chain.

- Boneless Meat: Some households and restaurants prefer boneless chicken meat for its convenience in cooking and serving. This processed product is especially popular in urban areas and among those who seek hassle-free meal preparation.
- Minced meat: Minced chicken meat, finely ground and versatile in culinary applications, serves as a popular choice for preparing a wide range of local delicacies and specially used in small local restaurants and hotels.
- Feathers and By-products: Poultry feathers are collected and processed into feather meal, which is used as a protein supplement in animal feed production. This not only reduces waste but also adds value to the poultry value chain.

These value-added products not only enhance the poultry sector's economic significance but also cater to the varied needs and preferences of the local population, contributing to food security and livelihoods in the region.

Constraints and opportunities in broiler poultry value chain

Constraints

1. Escalating Production Costs: The cost of poultry production in the Nepal is on the rise, primarily due to the increasing prices of feed ingredients. This surge significantly contributes to the overall cost of production, accounting for over 75% of expenses, as the production of essential feed ingredients, particularly maize, meets only a fraction of (40-50%) demand (Sharma,2010).
2. Inconsistent Supply of Quality Chicks: The availability of reliable, high-quality chicks at competitive prices is a critical determinant of poultry enterprise success. Unfortunately, in Sindhuli district, the absence of appropriate legal standards for chick quality assurance poses a substantial concern in this sector.
3. Bio-Security Neglect: Bio-security lapses, including bacterial and viral threats, as well as theft, undermine the poultry farming landscape in Nepal. In the study area, inefficient disease diagnosis, treatment, and prevention exacerbate these issues, with a significant proportion of small-scale poultry entrepreneurs lacking formal training in farm management (Acharya *et al.*,2015).
4. Slaughterhouse and Processing Plant Accessibility: The absence of meat processing plants in a district's poultry system restricts efficient processing and value addition, impacting food safety and the sector's

profitability. Additionally, it limits market reach, potentially reducing incomes for local poultry farmers.

5. Disease Outbreaks: Nepal grapples with recurring outbreaks of various diseases, including Avian Influenza, and H1N1 which inflicts substantial annual losses. Other prevalent infectious diseases include Infectious Bursal Disease, New Castle disease, coccidiosis, and pullorum.
6. Limited Poultry Production Knowledge: The poultry industry demands meticulous care and management for optimal results. However, there is a noticeable gap in comprehensive knowledge regarding successful poultry production, hindering progress.
7. Meat Price Volatility: Price fluctuations in poultry meat throughout the year present an additional challenge. These erratic shifts in unit prices create instability and difficulties for poultry enterprises.
8. Absence of Grandparent Stock Farms: The lack of grandparent stock farms in Nepal disrupts chicken production, contributing to elevated chicken costs. Furthermore, the underdevelopment of grandparent stock and hatchery farms in the country exacerbates the scarcity of quality chicks (MOAD,2013).

These challenges collectively impact the poultry industry in the study area necessitating comprehensive strategies and interventions for sustainable and efficient poultry production.

Opportunities

1. Growing Poultry Industry in Sindhuli: Sindhuli's transformation into a poultry hub offers significant economic potential, boosting national GDP. The increasing preference for poultry over red meat due to its affordability and health benefits presents a major opportunity for the sector. However, challenges remain in reducing production costs and ensuring product quality through effective regulations, training, and biosecurity**.**
2. Rising Demand in Urban Areas: The urban demand for poultry meat and eggs is growing substantially at annual rates of 25% and 10%, respectively. This demand provides a major opportunity for expanding poultry production to meet consumer needs. The annual growth rate of poultry bird production stands at a comparatively modest 2.38% (Acharya.et al.2015).
3. Employment Opportunities for Youth: The growing poultry sector is creating employment opportunities, especially for young people. This trend is contributing to both local and national economic development.

4. Increased Competition and Consumer Benefits: The rise of competition in the poultry sector is benefiting consumers through lower prices and improved product quality, spurring further industry growth

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CONCLUSION

Our research in Sindhuli District's poultry sector highlighted several important insights. Age and experience were closely linked among farmers, underscoring the value of accumulated knowledge in poultry management. While practical training in vaccination and rearing was common, there is a need for improvement in disease identification.

Biosecurity practices and disease history showed mixed results. Although intensive deep litter housing systems were widely used, which effectively control disease, there is still room to improve biosecurity measures and reduce antibiotic prophylaxis.

Agro-vets emerged as key players in Sindhuli's poultry ecosystem, serving as input suppliers, distributors, and traders. Their significant role in the local market underscores the importance of their presence in the poultry value chain.

To address the constraints in Nepal's poultry industry, especially in Sindhuli, a multifaceted approach is required. Research into alternative, cost-effective feed sources is necessary to combat rising production costs linked to feed prices. Establishing legal standards for chick quality will ensure a reliable supply of high-quality chicks at competitive prices. Enhancing training programs, particularly for small-scale farmers, is essential to bridge the knowledge gap and optimize production. Strengthening biosecurity measures and providing formal farm management training can help mitigate disease risks. Implementing price stabilization mechanisms can manage meat price volatility. Additionally, promoting the development of grandparent stock farms and hatcheries will ensure a consistent supply of quality chicks

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