Research Article

Assessment on Disease Control and Biosecurity Practices of in Commercial Poultry Farms of Dambi Dollo Town, Western Ethiopia

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Abstract | A cross-sectional study was conducted to evaluate the management of poultry diseases and the implementation of biosecurity measures on commercial farms. Information was collected through a semi-structured questionnaire, and the data were analyzed using SPSS software with statistical methods including chi-square tests, independent t-tests, one-way ANOVA, and the general linear model. Findings indicated that 36.5% of poultry producers identified coccidiosis as the most prevalent disease. Producers attributed the disease to environmental factors (34.6%), management practices (44.2%), or a combination of both (21.2%). Commonly reported clinical signs included ruffled feathers (13.5%), loss of appetite (11.5%), depression (11.5%), weight loss (9.6%), and diarrhea (7.7%). Approximately 79.6% of farms maintained good relationships with veterinarians and sought their advice on disease control. Regarding vaccination practices, 40.4% of farms administered vaccines solely for Newcastle disease (NCD), 51.9% for Fowl pox, and 7.7% for Infectious bursal disease (IBD), reflecting farmer-reported practices rather than a standardized schedule. Biosecurity measures were widely implemented, with 73.1% of producers using protective clothing, plastic boots, and hair covers, and 30.4% using hand gloves. A typical vaccination protocol would include IBD vaccination on day 1, NCD vaccination on day 7, and booster doses on days 14, 28, and 42 for other diseases. Farmers also reported giving Newcastle Disease boosters every two to three months to maintain long-term flock immunity.

Keywords | Disease prevention, Poultry mortality, Avian illnesses, Clinical signs

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INTRODUCTION

Ensuring the health of poultry flocks is vital for achieving high productivity, yet diseases continue to pose significant challenges in the industry, often causing substantial economic losses (Asfaw *et al*., 2021). The occurrence of poultry diseases is commonly associated with factors such as inadequate management practices, poor nutrition, and environmental stressors. Generally, a disease is characterized as any departure from an animal's normal physiological state, and poultry, like other animals, are susceptible to a wide spectrum of health disorders throughout their lifespan (Ponnampalam *et al*., 2022). Within commercial poultry operations, coccidiosis is frequently reported as the most prevalent condition (Singla and Gupta, 2012), followed by infectious bursal disease (IBD) and Newcastle disease (NCD) (Safari *et al*., 2004; Asfaw *et al*., 2021). Other notable diseases

impacting poultry include infectious bronchitis, Marek's disease, fowl cholera, fowl pox, and avian encephalomyelitis (Selvaratnam, 2020). In Ethiopia, viral infections such as Newcastle disease, IBD, and Marek's disease represent major threats to chicken populations. The etiological agents of poultry diseases include viruses, bacteria, mycoplasma, fungi, protozoa, and parasites (Region *et al*., 2022). Common clinical manifestations in commercial flocks encompass diarrhea (enteritis), ruffled feathers, depression, respiratory difficulties, coughing, excessive salivation, swelling of the head and eyes, and torticollis (neck twisting) (Hameed and Ahmed, 2019). Integrating routine biosecurity practices into daily management can significantly mitigate the risk of disease introduction, and prompt interventions are essential for sustaining productive poultry operations (Grace *et al*., 2024). Overall, effective disease management hinges on proper sanitation, systematic vaccination programs, and stringent biosecurity measures (Aly and Fathi, 2024). Despite the rapid growth of commercial poultry in Ethiopia, disease outbreaks continue to constrain production, particularly in emerging production areas with limited veterinary support. Expansion of commercial poultry farming in regions such as Dambi Dollo, driven by small- and micro-enterprise initiatives, has been accompanied by frequent disease outbreaks, insufficient veterinary services, and inconsistent vaccination practices, according to local agricultural reports. The region's remoteness, combined with limited veterinary infrastructure, diagnostic capacity, and access to quality vaccines and medications, further increases disease risks.

To date, there is no published research examining disease management and biosecurity practices in commercial poultry farms within and surrounding Dambi Dollo. Consequently, this study was designed to assess the implementation of disease control strategies and biosecurity measures among poultry farms in this region (Cige *et al*., 2023). The study targeted poultry farmers who are registered through the small- and micro-enterprise offices in and around Dambi Dollo town.

MATERIALS AND METHODS

Description of the study area

Dambi Dollo, situated in the Kellem Wollega Zone of the Oromia Region, is located roughly 642 km west of Ethiopia's capital, Addis Ababa. The zone encompasses an area of 987,457 hectares and is geographically bordered by West Wollega Zone to the north, Buno Bedele Zone to the east, Ilu Ababora Zone to the south, and the Gambella Region to the west. Elevations within the zone vary from 200 to 3,450 meters above sea level, and the landscape is classified into three agro-ecological categories: highland (26.1%), midland (41.4%), and lowland (32.5%). Temperatures generally range between 10 °C and 34 °C, while annual rainfall fluctuates from 1,400 mm to 3,200 mm, with an average of approximately 1,800 mm (Kumsa *et al*., 2024).

Sample size

A cross-sectional survey was conducted to identify the main challenges confronting commercial poultry farms in Dambi Dollo and its surrounding areas. Records from local agricultural and micro-enterprise offices indicated that about 52 commercial poultry farms were registered at the time of the study. While a census including all eligible farms was initially intended due to the small population size, logistical and accessibility limitations restricted data collection to farms that were operational and reachable during the study period. As a result, a purposive sampling approach was employed, targeting active farms with relevant production experience to ensure accurate and meaningful data. Despite being non-random, this method covered nearly the entire registered farm population, closely approximating a census and enhancing the representativeness and generalizability of the results within the region.

Research design and data collection

An observational study was undertaken to assess the strategies employed for disease management and the implementation of biosecurity measures in commercial poultry farms. Information was collected using a pre-tested semi-structured questionnaire, which was administered through face-to-face interviews with farm owners and managers, coordinated with the support of local small- and micro-enterprise offices. The survey collected comprehensive information on the disease control measures and biosecurity protocols employed on the farms.

Statistical analysis

The collected data were initially organized and cleaned in Microsoft Excel before being imported into SPSS version 29 for comprehensive statistical analysis. Descriptive statistics, such as frequencies, percentages, and means, were computed to summarize the dataset. For parametric analyses, independent samples t-tests were applied to compare two group means, while one-way Analysis of Variance (ANOVA) with post-hoc tests (e.g., Tukey's HSD) was used for comparisons across multiple groups. Relationships between categorical variables were assessed using Pearson's chi-square (χ^2) test. The assumptions of normality and homogeneity of variance were evaluated using the Shapiro-Wilk and Levene's tests, respectively, and a significance level of $p < 0.05$ was considered statistically significant.

RESULTS

Sociodemographic characteristics of respondents

Table 1 presents a summary of the sociodemographic characteristics of commercial poultry farmers in Dambi Dollo and its surrounding areas. The findings indicate that poultry farming in the area is predominantly male dominated, with 73.1% of respondents being men and 26.9% women. Participation of young farmers was considerable, as 53.8% of respondents were aged between 15 and 30 years, whereas only 11.5% were in the 46–60 age bracket. Most farmers (75%) were married, highlighting the involvement of household heads in poultry production. Regarding experience, most respondents (approximately 60%) had 1–3 years of involvement in poultry farming, while less than 8% had more than six years of experience, suggesting that the sector is relatively young and emerging. In terms of educational background, 38.5% of farmers had attained college or university-level education, representing the highest educational category. Household size distribution revealed that half of the respondents (50%) had small families of 1–3 members. Additionally, 61.5% of farmers relied entirely on poultry farming as their primary source of livelihood, while the remainder engaged in mixed economic activities.

Table 1: Sociodemographic characteristics of commercial chicken farmers in and around Dambi Dollo.

Variable	Category	N	%	X2	P-value
Sex of respondents	M	38	73.1	11.077[a]	0.001
	F	14	26.9		
Age of respondents	<15	3	5.8	29.077b	0.001
	15-30	28	53.8		
	31-45	15	28.8		
	46-60	6	11.5		
Marital status	Married	39	75.0	70.154b	0.001
of Commercial producers	Single	7	13.5		
	Divorced	3	5.8		
	Widowed	3	5.8		
Occupation of commercial producers	Farmers	32	61.5	24.269c	0.001
	Private job	17	32.7		
	Govt. Employers	3	5.8		
Family size	1-3	26	50.0	23.692b	0.001
	4-6	16	30.8		
	More than 6	10	19.2		
Experience in year	<3	31	59.6	21.038c	0.001
	3-6	17	32.7		
	More than 6	4	7.7		
Educational level	Illiterate	4	7.7	27.692d	0.001
	Read and write	5	9.6		
	Grade 1-4	3	5.8		
	Grade 5-8	9	17.3		
	High school	5	21.1		
	College and university	20	38.5		

*Significant effect at P<0.05.

Flock size of chicks in commercial poultry farms in and around Dambi Dollo

Table 2 provides an overview of flock sizes and breed composition across 52 commercial poultry farms in the Dambi Dollo area. The mean flock size was 734.6 ± 20.9 birds. Female chicks (654.8 ± 24.5) outnumbered male chicks (569.2 ± 32.7), indicating a production system skewed toward females. Regarding breed distribution, Bovans Brown was the most prevalent, accounting for 55.8% (905.77 birds) of the total population, followed by Sasso T44 at 23.1% (554.62 birds) and mixed breeds at 21.2% (589.62 birds). Statistical analysis showed significant variation in flock sizes among the different breeds (P < 0.05), highlighting a clear preference among farmers for Bovans Brown in this region.

Table 2: Flock sizes and breed composition of commercial poultry farms in and around Dambi Dollo.

Variables		N (%)	Mean (SEM)
Flock size		52(100%)	734.6154 (20.89343)
Sex	Female chicks	52(100%)	654.83 (24.499)
	Male chicks	18(34.6%)	569.23 (32.700)
Breed	Bovans brown (egg type)	29 (55.8%)	905.7692 (17.24053)
	Saso T44	12 (23.1%)	554.6154 (15.07513)
	Mixed	11 (21.2%)	589.6154 (12.89814)

Note: N (%) represents the number and percentage of producers; SEM denotes the standard error of the mean. Means in the same column with different superscript letters differ significantly (P < 0.05).

Diseases and signs in commercial poultry farms

Figure 1 Shows that symptoms seen in commercial poultry farms in and around Dambi Dollo clinical signs observed in affected poultry included ruffled feathers (13.5%), appetite loss (11.5%), depression (11.5%), weight loss (9.6%), and diarrhea (7.7%). Most farmers (65.4%) reported little to no experience in managing disease outbreaks, which raises concerns regarding timely intervention. However, the study found that 98.1% of respondents maintained close contact with veterinarians for disease management.

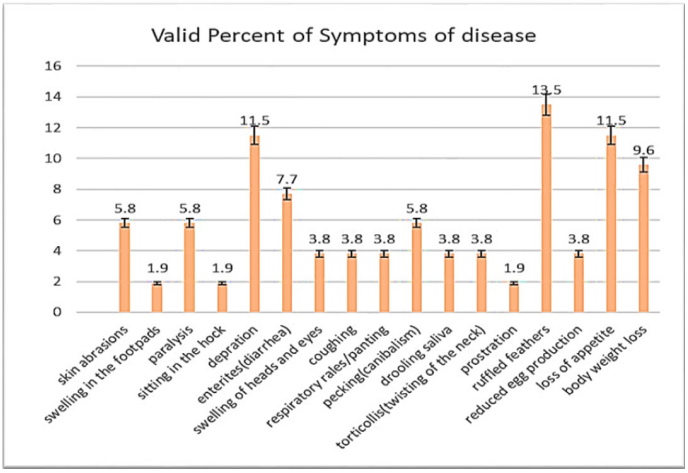

Figure 1: Symptoms seen in commercial chicken farms in and around Dambi Dollo.

Disease management and veterinary services

Table 3 illustrates the disease management practices of commercial chicken farmers in and around Dambi Dollo. Most farmers (78.8%) implemented quarantine for affected birds, and 90.4% reported experiencing disease outbreaks. Although 98.1% of farmers reported having access to veterinarians and consulting them in case of emerging health problems, the persistence of limited disease recognition (63.5% unable to name major diseases) suggests that the farmer–veterinarian interaction is largely reactive and treatment-oriented, rather than preventive or knowledge-building. In that context, farmers often rely heavily on veterinary specialists for diagnosis and treatment rather than being actively engaged in learning about diseases, symptoms, and early identification. This is quite a common pattern in developing poultry systems, where the structure of a veterinary visit often focuses on clinical interventions and the distribution of medicines rather than structured farmer training or continuous advisory support. Hence, the high veterinary contact rate likely reflects access to services for acute care rather than effective extension-style engagement. Strengthening advisory roles, routine on-farm training, and preventive education programs should be emphasized in enhancing farmers' disease literacy and ensuring better long-term resilience of poultry health management systems.

In most cases, 80.8% of birds recovered within 1–3 days of treatment, suggesting generally effective health-care practices; this rapid recovery was primarily associated with commonly used interventions such as broad-spectrum antibiotics, anticoccidials, and supportive therapies, including vitamins and electrolytes. This may suggest that these treatments are timely and appropriate responses; however, its further points to the need for improved antimicrobial stewardship and more transparent treatment practices to make sure diseases are managed responsibly.

Table 3: Veterinary engagement and treatment in commercial chicken farms in and around Dambi Dollo.

Variables	Responses	N	%	X^2	P-value
Close relation with veterinarian	Yes	51	98.1	48.077a	0.001
	No	1	1.9		
Skilled in vaccine/ treatment dissemination protocols	Yes	49	94.2	40.692a	0.001
	No	3	5.8		
Time of recovery after treatment	1-3 days	42	80.8	54.500b	0.001
	4-6 days	9	17.3		
	No recovery	1	1.9		
When do you call a veterinarian?	At sickness	47	90.4	33.923a	0.001
	At death (>1 chick)	5	9.6		
Accustomed to treat chicks yourself	Yes	47	90.4	33.923a	0.001
	No	5	9.6		
Presence of isolation room	Yes	40	76.9	15.077a	0.001
	No	12	23.1		

Table 4: Vaccination practices in commercial poultry farms in and around Dambi Dollo.

Variables	Responses	N	%	X^2	P-value
Do you vaccinate your chicken?	Yes	50	96.2	44.308a	0.001
	No	2	3.8		
Vaccination of the disease	NCD	21	40.4	16.423b	0.001
	Fowl pox	27	51.9		
	IBD	4	7.7		
Frequency of vaccination	Once	6	11.5	22.308c	0.001
	Twice	4	7.7		
	Thrice	17	32.7		
	Four times	25	48.1		
Adherence to vaccination schedule	Adhered	45	86.5	66.269b	0.001
	Non-adhered	7	14.5		
Do you know the name of vaccine?	Yes	39	75.0	13.000a	0.001
	No	19	25.0		

Vaccination in commercial poultry farms

Table 4 shows that vaccination practices among commercial poultry farms in and around Dambi Dollo. The study recorded very high vaccination uptake, with 96.2% of farmers vaccinating their birds (X^2= 44.308, $p < 0.001$), reflecting strong awareness of preventive health practices. Contrary to expected patterns in commercial poultry systems, Fowl Pox vaccination was more common than NCD vaccination (51.9% vs. 40.4%, respectively). This is notable, considering that NCD is widely recognized as one of the most devastating poultry diseases. Farmers indicated prioritizing Fowl Pox vaccination mainly because its clinical signs are visible and it is frequent in the area, coupled with reportedly stronger local promotion by veterinary extension agents during vaccination campaigns. On the other

hand, some farmers may have perceived NCD vaccines as less available, or assumed routine government-driven vaccinations were enough to neutralize the risk of this disease. These findings suggest that vaccine prioritization in the study area may be dictated by perceived local disease pressure, vaccine availability, and advisory guidance rather than global risk profiles, emphasizing the need for an education that is going to boost farmers' awareness on the critical position of NCD in poultry management programs.

The highest proportion of respondents practiced fowl pox vaccination, 51.9%, followed by Newcastle Disease, 40.4%, and Infectious Bursal Disease was the least considered, at 7.7%. Although these figures indicate significant differences in vaccine adoption, deeper interpretation points toward very important behavioral and management drivers. Farmers very often mentioned prioritizing fowl pox vaccination because of the presence of clinical signs and perceived long-term impact on production, while Newcastle Disease vaccination, despite its well-recognized severity, was occasionally delayed or incompletely applied due to managerial challenges of handling the vaccine, incomplete cold-chain systems, and uncertainty about proper revaccination schedules. The lowest level of Infectious Bursal Disease vaccination has reflected both poor awareness of its economic importance and poor local availability of the vaccine. These data underscore the need for enhanced farmers' education and adequate systems of vaccine distribution to ensure balanced and efficient strategies of disease prevention.

Farm management, disease control and preventive strategies in commercial poultry

Table 5 presents farm management practices and reporting among commercial poultry farms in and around Dambi Dollo. The survey revealed that coccidiosis was the most common disease, affecting 36.5% of the farms. However, 63.5% of producers were unable to identify the specific diseases present in their flocks, indicating a lack of disease awareness and diagnostic skills. The study also found that 65.4% of producers lacked experience in managing or reporting disease outbreaks, reflecting limited preparedness and access to veterinary extension services

Most farmers (90.4%) administered treatments themselves but sought veterinary consultation when birds became seriously ill. Record-keeping was strong, with 86.5% maintaining farm records.

Seasonal trends and cost considerations in commercial poultry farms

Seasonal loss patterns and cost perceptions among poultry producers in and around Dambi Dollo revealed that mortality peaks occurred during the long rainy season (32.7%), although this trend was not statistically significant (p = 0.511). Most farmers (69.2%) considered vaccines affordable, while 23.1% perceived them as costly. Additionally, a strong preference for prevention over treatment was observed, with 92.3% prioritizing preventive measures, indicating good awareness of cost-effective disease control practices.

Table 5: Farm management and reporting in commercial poultry farms in and around Dambi Dollo.

Variables	Responses	N	%	X^2	P-value
Immediate measure for sick birds	Isolation + follow-up	41	78.8	17.308a	0.001
	Isolation+treat	11	21.2		
Experiences for disease outbreak	Yes	18	34.6	4.923a	0.027
	No	34	65.4		
Reporting disease outbreak	Yes	47	90.4	33.923a	0.001
	No	5	9.6		
Types of disease frequently occurred	Coccidiosis	19	36.5	3.769a	0.052
	Don't know	33	63.5		
Accustomed to recording the disease	Yes	45	86.5	27.769a	0.001
	No	7	13.5		

Table 6: Mortality and risk factors in commercial poultry farms in and around Dambi Dollo.

Variables	Responses	N	%	X^2	P-value
Major disease control measures	Prevention	48	92.3	37.231a	0.001
	Treatment	4	7.7		
High mortality age	1-3 weeks	31	59.6	17.577b	0.001
	4-6 weeks	14	26.9		
	>6 weeks (adult)	7	13.5		
Season of high loss	Long dry (Oct-Jan)	10	19.2	2.308c	0.511
	Short rainy (Feb-Mar)	11	21.2		
	Short dry (Apr-May)	14	26.9		
	Long rainy (Jun-Sep)	17	32.7		
Reason for mortality	Transportation stress	25	44.6	22.769b	0.001
	Overcrowding	17	30.4		
	Cannibalism	7	12.5		
	Unclear	3	5.4		
Type of mortality	Sudden death	34	65.4	25.077b	0.001
	Sporadic	18	34.6		
Mortality rate	Reported	4	7.7	-	-
Survival rate	Reported	48	92.3	-	

Mortality in commercial poultry farms

Table 6 shows the mortality profile of commercial poultry farms in and around Dambi Dollo. Mortality was greatest

in (1-3 weeks: 59.6%), and sudden death was most frequent (65.4%). Transport stress (44.6%) and overcrowding (30.4%) were prominent causes of mortality, indicating areas where management may be improved. Most chicks within the study area originate from far regional hatcheries; thus, they need many hours to travel under fluctuating handling and temperature conditions. This may seriously increase the level of stress and predisposition to early mortality. Improving transport through proper ventilation, temperature control, shorter delivery intervals, and using trained handlers, coupled with encouraging the establishment of nearer hatchery supply points, would significantly help reduce the losses in transportation.

Biosecurity on commercial poultry farms

Table 7 illustrates the biosecurity practices implemented by commercial poultry farms in and around Dambi Dollo. The findings reveal that poultry farmers generally maintained a fairly high compliance with key biosecurity protocols. The use of protective clothing was fully complied with by 73.1% of the respondents ($X^2 = 11.077$, $p < 0.001$), followed by foot baths and boots, both 67.3% ($X^2 = 6.231$, $p = 0.013$), while gloves were used by only 30.4% of farmers. In discussions, many farmers did not consider gloves to be as critical for everyday handling of birds, and some farmers reported discomfort and limited availability. Gloves seem to be perceived as secondary or only necessary in cases of outbreaks, whereas boots or overalls have been adopted as an integral part of everyday farm activities.

Table 7: Biosecurity practices in commercial poultry farms in and around Dambi Dollo.

Variables		N	%	X2	Value
Presence of foot bath	Yes	35	67.3	6.231a	0.013
	No	17	32.5		
Wearing protective clothes	Yes	38	73.1	11.077a	0.001
	No	14	26.9		
Using hand gloves	Yes	17	30.4	6.231a	0.013
	No	35	62.5		
Wearing boots	Yes	35	67.3	6.231a	0.013
	No	17	32.7		

Most farms reported using formalín or berkina disinfectant in foot baths, typically prepared at an estimated concentration of about 2–5% based on farmer responses. Solutions were generally replaced every 2–7 days, depending on farm activity and resource availability. While these practices reflect a willingness to maintain hygiene, variability in concentration and replacement frequency suggests that some farms may have suboptimal foot bath efficacy. Strengthening farmers' knowledge of appropriate disinfectant concentration and regular changing schedules is therefore imperative, given that poorly maintained foot baths can compromise biosecurity and increase disease transmission risk. The study revealed that commercial poultry farmers in Dambi Dollo face several challenges, including limited knowledge of poultry diseases, insufficient disease management and reporting, and gaps in biosecurity practices. Among biosecurity measures, 73.1% of producers used protective clothing (tuta), 30.4% used gloves, and 67.3% used boots. Footbaths were widely implemented, with 77.6% of farmers applying disinfectants such as formalin or berekina at farm entrances. Small-scale farms were observed to have comparatively weaker biosecurity practices. Additionally, vaccination coverage was generally high, but some gaps remained, particularly regarding low-coverage vaccines like Infectious Bursal Disease.

DISCUSSION

The predominance of male respondents in this study is consistent with prior research highlighting male dominance in agricultural enterprises across Africa (Awoke *et al*., 2024). This trend may be attributed to cultural norms, disparities in asset ownership, and gender-specific labor divisions. Additionally, the high participation of youth (53.8%) aligns with findings by Ipara *et al*. (2023), suggesting an increasing interest among younger populations in poultry agribusiness as a viable livelihood and income-generating option. Limited involvement of older individuals may be associated with the physically demanding nature of poultry management or a preference for less labor-intensive occupations.

The observation that 75% of respondents were married indicates greater engagement of household heads in commercial poultry ventures. Marriage may provide advantages such as shared labor, financial stability, and family support systems, comparable to findings reported by Rietveld *et al*. (2023) and Naidoo and Kodjo (2023). Most respondents had only 1–3 years of experience in poultry farming, suggesting that the sector is still developing in the region. This may reflect growing market opportunities and recent policy attention, yet may also highlight challenges such as disease burden, input constraints, and market volatility leading to high turnover rates. Therefore, strengthening capacity-building initiatives, including technical training and extension support, remains essential. The relatively high proportion of educated respondents (38.5% with tertiary education) underscores the role of formal education in facilitating adoption of improved production and management technologies, consistent with reports from the Ministry of Agriculture (2022) and Nwobodo *et al*. (2023). Likewise, small household sizes and the reliance of 61.5% of respondents solely on farming suggest increased specialization in poultry production, in line with observations by Awoke *et al*. (2024) and Gonta (2023).

Overall, the sociodemographic attributes gender, age, marital status, education, and farming experience were significant determinants of participation and performance in poultry production ($p < 0.001$). These findings reinforce the importance of youth-focused support programs, gender-responsive interventions, and strengthened training systems to foster sustainable commercial poultry development in Ethiopia, consistent with recommendations from Mohd Suib *et al.* (2023).

Furthermore, the predominance of female chicks reflects typical commercial poultry production practices where female birds are prioritized for egg-laying purposes. This trend aligns with national statistics indicating that female poultry make up approximately 68–72% of the total flock in Ethiopia (Muriithi, 2023) and corresponds with observations by Sinclair *et al.* (2022).

The preference for Bovans Brown (55.8%) reflects its popularity in commercial egg production due to its high laying performance, adaptability, and productivity. This aligns with national reports indicating 58–62% adoption of Bovans Brown strains in Ethiopian commercial poultry farms (Vlaicu *et al.*, 2024). The significant influence of breed type on flock size suggests that producers strategically select high-performing breeds to enhance productivity and profitability.

The high occurrence of coccidiosis aligns with literature identifying it as a major poultry disease in intensive systems, often associated with hygiene and litter challenges (Cornell, 2020). The large proportion of farmers unable to diagnose diseases highlights a significant knowledge gap, like the findings of (Billy and Nairobi 2019), and underscores a risk to effective disease control. The absence of record-keeping further hinders timely and targeted interventions, consistent with Mohsin and Mehak (2024) who emphasize the importance of documentation for health monitoring. Producers' attribution of disease to environmental and management-related factors supports the notion that poultry health challenges are multifactorial, in agreement with (Grace *et al.* 2024). The limited disease management experience (65.4%) highlights inadequate veterinary support systems, which could delay response to outbreaks and increase economic loss, as noted by Tao *et al.* (2021). These results emphasize the need to strengthen farmer training, biosecurity practices, and veterinary extension services. The clinical signs recorded in this study correspond with those reported by (Bezabih *et al.*, 2017). The limited experience in dealing with disease outbreaks mirrors findings from Kaduna, Nigeria, where farmers did not frequently report disease cases due to limited management knowledge (Analysis of Farm Enterprise Combinations Under Risk, 2021). However, unlike the Nigerian case where veterinary support was limited (Nu'man, 2023), the high level of veterinary consultation (98.1%) among Dambi Dollo producers indicates a positive trend toward improved disease surveillance and control. This underscores the importance of veterinary access in reducing poultry health risks and improving production outcomes.

The high rate of quarantine practice (78.8%) exceeds reported levels in Nigeria and Tanzania (60–65%) as noted by Ekiri *et al.* (2025) and Lai *et al.* (2023), indicating stronger biosecurity awareness in Dambi Dollo farms. Similarly, the outbreak reporting rate of 90.4% surpasses the 55–70% reported in other Ethiopian production systems (Phonde, 2004), reflecting improved transparency and disease surveillance. Veterinary contact rates (98.1%) were substantially higher than Kenya's 82% (Bahta *et al.*, 2023) and Uganda's 75% (Deiana *et al.*, 2024), suggesting better access to veterinary support in the study area. However, knowledge gaps persist, with 63.5% unable to identify common poultry diseases consistent with observations in Ghana (Boansi *et al.*, 2024) and India (Sharma *et al.*, 2022). The rapid recovery rate (80.8%) aligns with reports from South African commercial poultry farms (85–90%) (Moeletsi *et al.*, 2023), indicating effective treatment response. Collectively, these findings highlight strong veterinary engagement but emphasize the need for enhanced farmer training in disease recognition and preventive health management.

The high vaccination coverage (96.2%; $X^2 = 44.308$, $p<0.001$) in Dambi Dollo exceeds the reported range of 72–85% in other Ethiopian regions (Asfaw *et al.*, 2021) and surpasses neighboring countries where vaccination rates range from 65–80% (Ababa, 2023). Prioritization of Fowl pox (51.9%) over Newcastle Disease (40.4%) contrasts with global patterns that rank NCD vaccination at 60–75% (Oie, 2023). The very low coverage of Infectious Bursal Disease vaccination (7.7%) aligns with findings from the Amhara region (Alemu *et al.*, 2024), highlighting a national consistency in low IBD prevention. These results also mirror findings from Nigeria, where farmers practice routine multiple vaccination, particularly against Gumboro, NCD, and Fowl pox (Negash *et al.*, 2022). However, the lower vaccination rates reported in Bahir Dar (Bereket *et al.*, 2022) show regional disparities in vaccine use. Although Dambi Dollo demonstrates strong vaccination commitment, improving access and awareness for under-prioritized vaccines like IBD remains critical to strengthening overall poultry health security.

The high rate of farmer-led treatment (90.4%) aligns closely with findings from Tanzania (88%) and Kenya (85%), where smallholder and semi-commercial farmers similarly prefer first-line self-treatment before veterinary engagement (Ouma *et al.*, 2023). The adoption of isolation

units in Dambi Dollo (76.9%) surpasses Nigeria's 62% (Entsua-Mensah *et al*., 2022), suggesting better awareness of disease containment. Chick mortality in the first 1–3 weeks (59.6%) is consistent with global trends reported by (Rana *et al*. 2023), emphasizing universal vulnerability of young birds. However, transport-related mortality (44.6%) was notably higher than Uganda's 35% (Applestein *et al*., 2021), suggesting logistical and handling constraints in the local supply chain. These findings reflect generally good management practices but point to opportunities for improvement, particularly in chick transport systems, brooding management, and reducing overcrowding-related losses.

The rainy-season mortality peak (32.7%) closely matches the 35% reported in Zambia (Oduma *et al*., 2023), but contrasts with Sudan's dry-season mortality pattern (Ahmed *et al*., 2025), highlighting regional climatic influences on disease dynamics. Farmer perception of vaccine affordability (69.2%) is higher than the 55% reported in Ghana (Donkor *et al*., 2025), suggesting better access or pricing in the study area. Moreover, the strong focus on prevention (92.3%) exceeds reported rates in Nigeria (78%; Tesfaye and Mohammed, 2023), indicating higher awareness and adoption of proactive biosecurity measures among Ethiopian poultry farmers. Collectively, these trends imply positive economic awareness regarding disease prevention despite seasonal vulnerability.

The observed chick mortality (13.5%) exceeds the recommended threshold of ≤5% by the third week (Hameed and Ahmed, 2019), indicating areas for improvement in early chick care and transport management. The seasonal mortality peak during the rainy period aligns with weather-associated challenges documented in other regions. Risk factors such as transport stress and overcrowding correspond with previous findings from (Matebie *et al*., 2023) and Mangan and Siwek (2024), who also reported management stressors as leading contributors to early poultry mortality. Thus, despite overall manageable mortality rates, targeted interventions for chick transport practices, brooding management, and density control are necessary to further reduce losses.

The level of protective clothing usage in Dambi Dollo (73.1%) surpasses that reported in Nigeria (58%; Ekakoro *et al*., 2025), highlighting stronger compliance in this study area. Footbath utilization (67.3%) also exceeds rates recorded in Tanzania (52%; Ouma *et al*., 2023), suggesting a higher level of awareness regarding contamination control. However, glove use (30.4%) remains low, reflecting similar gaps noted in other African poultry systems (Getso and Hassan, 2020). Footbaths and protective clothing play crucial roles in limiting pathogen entry, and their widespread use in Dambi Dollo demonstrates positive commitment toward disease prevention. Nonetheless, comprehensive biosecurity demands integrated practices beyond personal protective equipment, including proper facility hygiene, movement control, waste disposal, and effective communication between farms. Strengthening glove use and reinforcing full-spectrum biosecurity.

The results underscore the critical need for farmer training and awareness programs to improve disease recognition, reporting, and management. Comparisons with other studies indicate similar patterns: Nusirat *et al*. (2012) reported that 35.1% of respondents did not use protective clothing, and 18.9% used gloves, while Getso and Hassan (2020) and Birhanu *et al*. (2015) observed high adoption of protective clothing and foot baths in Ethiopian farms. The use of footbaths (77.6%) aligns with findings in Mekelle, where 80% of farms practiced entrance disinfection (Tadesse *et al*., 2024). Nevertheless, small-scale farms remain at risk due to weak biosecurity, which can facilitate the introduction of infectious agents (Olakiumide, 2021; Kithome *et al*., 2022). Enhancing disease control, vaccination adherence, and comprehensive biosecurity practices is essential for reducing losses and improving productivity. Targeted farmer training, better access to veterinary services, and robust preventive measures will contribute to more sustainable commercial poultry farming systems in the region (Grace *et al*., 2024).

CONCLUSION

A study in Dambi Dollo, Ethiopia, recognized the major shortcomings in poultry disease management, including low disease awareness in 63.5% of farmers, infrequent biosecurity with only 30.4% glove use, high early chick mortality of 59.6%, and seasonal outbreaks with 32.7% rainy-season mortality. The other problems were transport stress at 44.6%, vaccine effectiveness concerns despite 96.2% coverage, and inadequate veterinary coordination. To tackle these issues effectively, a multi-sectoral approach involving government departments, veterinary department, and poultry farmers' associations is required. Solutions proposed include the establishment of farmer training to improve knowledge on diseases, mandating better biosecurity measures, better brooding, and implementing climate-adapted practices. Furthermore, implementing quality control on vaccine handling, improving transport conditions, and strengthening veterinary collaboration via mobile clinics or extension services would also weaken disease pressures and mortality. Marrying such targeted interventions with infrastructural investments like climate-controlled poultry houses would allow the poultry industry in Dambi Dollo to achieve sustainable flock health improvements and overall productivity.

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NOVELTY STATEMENT

This is a first-of-its-kind study to assess the effectiveness of disease control measures and biosecurity in the poultry farms of the region: namely, the town of Dambi Dollo in Western Ethiopia, pointing out the important gaps that exist in this regard.

AUTHOR CONTRIBUTION

All authors equally contributed to the study design, data interpretation, manuscript writing, and review.

Data availability

The datasets generated and analyzed during the current study are available from the corresponding authors upon reasonable request.

Ethics statement

All procedures involving animals were reviewed and approved by the Animal Use and Ethics Committee, South Africa University, College of Environmental Sciences – Animal REC (Approval No. 2024/CAES_AREC/5937).

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Generative AI and AI-assisted technology statement

No artificial intelligence tools were used in this study. All analyses, interpretations, and final editing were conducted exclusively by the authors, ensuring full academic originality, rigor, and integrity.

Conflict of interest

The authors have declared no conflict of interest.

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