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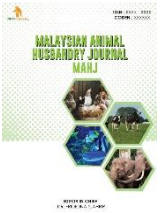

RESEARCH ARTICLE

# LAYING HEN WELFARE IN INTENSIVE FARMING SYSTEM IN SRI LANKA: A FIVE FREEDOMS APPROACH

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**ABSTRACT**

Animal welfare refers to the state of an animal's physical and mental health as well as its well-being, humane treatment, and appropriate care. The purpose of this study was to evaluate the welfare of a flock of laying hens on an intensive farm in Kundasale, Sri Lanka's mid-country. The Five Freedoms and welfare indicators, including as behaviour, environmental circumstances, and production statistics, were used to evaluate the overall welfare of the farm. The Five Freedoms and behaviours like eating, drinking, relaxing, strolling, dust bathing, foraging, excretion, and flapping were among the welfare indicators that exhibited notable variations. The Kundasale farm in Sri Lanka was categorised as a "Normal farm" with an overall wellbeing score of 44.73%, which is between 40 and 60%. In terms of meeting the needs of the intensive broiler breeder farm, the results of this assessment contributed to enhancing flock welfare standards and improvements in the poultry farming practices of this farm.

**KEYWORDS**

Behaviour, Farm, health, poultry. welfare indicators

## 1. INTRODUCTION

The connection between animal welfare, farming practices, and socio-economic factors is becoming a more important topic in today's agriculture (De Rosa et al., 2009). The poultry industry is one of the fastest-growing agricultural sectors in the world. Most of the poultry production systems are raised on commercial scales and have seen rapid changes over the years. Over the past six decades, the commercial poultry industry has seen enormous research efforts to develop and validate poultry welfare assessment methodologies, identify welfare problems in various poultry production systems, and evaluate housing modifications, management methods, and technologies to improve welfare from hatch to slaughter (Mench 2018). However, the implications of these divergent systems on the welfare of laying hens remain a subject of substantial debate and exploration. Sri Lanka, endowed with a rich agricultural heritage and characterized by a substantial agricultural land area, has witnessed the coexistence of traditional extensive farming practices and modern intensive approaches (Hitihamu et al., 2021).

In 2018, the management of Day-Old Chicks import numbers signaled the start of self-regulation of egg production. Layer hatchery owners voluntarily pay for this rule. In order to apply agreed import control, the Department of Animal Production and Health becomes a mediator. However, expanding parent and commercial layers were culled due to the same impact which resulted in roughly 250 million eggs being produced, which amounted to 2435.96 million eggs produced end of the year. Imports of layer parents are expected to remain at the roughly 100,000 in 2021. Estimates indicate day-old chick production of 3,180.80 million eggs is expected to be produced that (Department of Animal Production and health, 2021). Even though chickens and people are vastly different from one another, it is believed that they are nonetheless capable of feeling emotions like pain or irritation. To ensure the well-being of such a huge number of animals, ethical considerations must be put into the raising of poultry. It's a common misconception that good output would automatically result in good welfare (Nicol and Davies 2014). Welfare refers to the equilibrium of the complex mixture of emotions related to brain states brought on by different sensory stimuli and cognitive processes during a poultry life. Because illnesses and injuries can affect feelings, it is evident that even though this is about feelings, it is also tied to physical and mental health. However, as one can be concerned about their health without also being concerned about their welfare, worries about welfare do not always equate to concern for health (Mahon, 1999). Animal welfare is a multifaceted or multidimensional state since it is made up of numerous factors that affect the quality of an animal's existence. They are typically grouped in order to address the vast array of pertinent factors. There are numerous ways to accomplish this. To the Terrestrial Animal Health Code of World Organization for Animal Health, an animal is in good welfare if it is Comfortable, well-nourished, healthy, free from unpleasant states and able to exhibit behaviours that are crucial to its mental and physical states (Knierim et al., 2022).

The Five Freedoms, which form the foundation of animal welfare standards, include: freedom from hunger and thirst; freedom from discomfort; freedom from pain, injury, and disease; freedom to express normal behavior; and freedom from fear and distress. The five freedoms are one of the fundamental principles governing animal care because of their significant influence. They are also cited in the majority of European welfare laws, cited by international veterinary and animal welfare organizations, and serve as the foundation for OIE Terrestrial Animal Health (Bayvel and Cross, 2010).

The primary welfare issues for commercially bred laying hens include bone issues, such as osteoporosis and the high frequency of bone fractures that come from it, behavioural deprivation brought on destructive

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pecking, and plumage loss, which occurs in all types of housing arrangements. To enhance the wellbeing of laying hens, environmental aspects such as production methods, managerial strategies, and other aspects of the environment can be established and enhanced by (Alm and Sveriges, 2015).

This study aimed to assess the welfare status of laying hens an intensive farming system using five freedom concepts. And in also identifies the effect of Laying hens, determines the welfare status of the laying hens, and provides knowledge about animal welfare and the Five freedom factors

## 2. METHODOLOGY

### 2.1 Location of the study

The study was conducted in Sri Lanka's Kundasale. Kandy City is located 528 meters above mean sea level at latitude 7.2906° N and longitude 80.6337° E. The Kandy district is situated between North Latitude 60.560 and 70.290 and East Longitudinal 80.250 and 80.000. It includes the wet and intermediate climate zones of the mid-country. At 465 meters above mean sea level, Kandy receives 1840 millimetres of precipitation year, with typical temperatures between 20 and 220 degrees Celsius and humidity levels between 70% and 79%. cattle inside the 1940 km2 total agricultural area of the Kandy district.

The district offers a lot of potential for poultry production. Rainfall ranges between 1500 to 1800 mm every year. The range of humidity is 70% to 75%.Kandy City is located 528 meters above mean sea level at latitude 7.2906° N and longitude 80.6337° E. The Kandy district is situated between North Latitude 60.560 and 70.290 and East Longitudinal 80.250 and 80.000.

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### 2.2 Sample and Data Collection

The study was carried out with 45weeks – 50 weeks old Cobb 500 breeders, and 200 hens reared under an intensive farming system. Birds were taken to represent the entire flock and they were introduced to the new sheds under the same conditions as the whole flock. 20 hens were introduced to each replicate and assess their observations. This assessment was observed for two hours each day and 12 minutes per cage. A random sampling method was used for data collection in the intensive farm. The primary data were collected by observation. The records included climate conditions, behavioural analysis and five freedom assessments in the farm. Climate conditions, Behavioural observation, five freedom assessments, and Farm production were recorded daily. At the end of every week, the five-freedom assessment was calculated. Under ethical consent, all the data were collected. The research took place between June and December 2023.

### 2.2 Data Analysis

The study was to assess the welfare of a breeder farm in Kundasale. All data were gathered from filled records, checked thoroughly, and entered into a Microsoft Excel sheet for analysis. The collected data was subjected to descriptive and inferential analysis using Microsoft Excel 2016 and SPSS version 27.0. In the inferential analysis, the behavioural study was analysed by Generalized Linear Model with a post-hoc test using the Tukey test at a significant level of 0.05.

## 3. RESULTS AND DISCUSSION

This cross-sectional study on an intensive poultry farm system in Kunadasale focuses on poultry farm management practices. According to the analysis results in Table 1, there are climatological parameters where the temperature fluctuates between 25 – 30 degrees Celsius. Average, in 5th week has the maximum temperature is 29.42% in this area and the minimum temperature have in 3rd week is 27.28%.

**Table 1:** Climatological Parameters of the Farm

| Variables | Mean±SD | Minimum | Maximum |
|---|---|---|---|
| Rainfall (mm) | 11.30±7.27 | 00.00 | 80.00 |
| Temperature (°C) | 28.02±1.27 | 25.00 | 30.00 |
| Relative Humidity (%) | 79.81±6.61 | 61.00 | 95.00 |
| Heat index (°F) | 79.04±2.27 | 72.00 | 84.00 |

***Note;*** *The above table shows that daily climatological parameters are significantly related to the welfare of laying hens in the study location intensive farming system. The mean of four parameters is shown within 42 days. Means are not statistically significant (p>0.05) because of same location.*

The behavioral activities of the laying hens were listed in Table 2. In comparison to the previous weeks, feeding behaviour varied, with notable decreases in the second and fifth weeks (27.00% and 24.24%). While drinking, walking, dust bathing, preening, vocalisation, flapping, and excretion behaviours stayed largely constant over the weeks with no discernible changes, resting activity rose during the second and fifth weeks. In the second and fifth weeks, foraging dramatically declined, but it remained constant in the remaining weeks. Overall, certain behaviors such as feeding and foraging showed notable fluctuations, particularly in the 2nd and 5th weeks, indicating possible environmental or physiological influences during those periods. Overall, behavior analysis showed more foraging, preening and walking behaviors, where certain habits were significantly impacted by age. Feeding, standing, resting, and movement behaviors declined with age (Bergmann et al., 2017).

**Table 2:** Behaviors of laying hens

| Behaviours | 1st week | 2nd week | 3rd week | 4th week | 5th week | 6th week |
|---|---|---|---|---|---|---|
| Feeding | 33.24±2.87%$^{a}$ | 27.00±2.34%$^{b}$ | 33.48±2.88%$^{a}$ | 33.00±2.84%$^{a}$ | 24.24±2.10%$^{c}$ | 33.48±2.89%$^{a}$ |
| Resting | 25.44±0.71%$^{a}$ | 29.72±1.21%$^{b}$ | 24.48±0.83%$^{a}$ | 25.32±1.14%$^{a}$ | 28.88±1.19%$^{b}$ | 25.20±1.03%$^{a}$ |
| Drinking | 42.71±0.57%$^{a}$ | 42.48±0.86%$^{a}$ | 42.48±0.99%$^{a}$ | 42.48±1.07%$^{a}$ | 45.12±0.80%$^{a}$ | 42.60±0.69%$^{a}$ |
| Walking | 90.12±0.79%$^{a}$ | 89.88±0.60%$^{a}$ | 90.12±0.49%$^{a}$ | 89.76±0.69%$^{a}$ | 88.92±0.83%$^{a}$ | 89.88±0.96%$^{a}$ |
| Dust bathing | 14.52±0.50%$^{a}$ | 14.40±0.50%$^{a}$ | 13.68±0.66%$^{a}$ | 14.88±0.59%$^{a}$ | 15.48±0.45%$^{a}$ | 14.28±0.64%$^{a}$ |
| Preening | 73.08±2.09%$^{a}$ | 73.08±2.04%$^{a}$ | 73.20±2.33%$^{a}$ | 72.96±2.23%$^{a}$ | 73.08±2.33%$^{a}$ | 72.96±2.26%$^{a}$ |
| Vocalization | 33.48±1.34%$^{a}$ | 32.76±1.44%$^{a}$ | 34.68±1.72%$^{a}$ | 33.36±1.32%$^{a}$ | 34.68±1.33%$^{a}$ | 33.36±1.42%$^{a}$ |
| Flapping | 12.96±0.52%$^{a}$ | 13.44±0.38%$^{a}$ | 12.12±0.23%$^{a}$ | 11.88±0.26%$^{a}$ | 15.12±0.49%$^{a}$ | 11.88±0.38%$^{a}$ |

| **Table 3 (Cont):** Behaviors of laying hens | | | | | | |
|---|---|---|---|---|---|---|
| Excretion | 45.24±1.74%[a] | 43.20±1.38%[a] | 45.84±1.08%[a] | 43.92±1.78%[a] | 46.80±2.06%[a] | 44.64±1.72%[a] |
| Foraging | 75.36±2.10%[a] | 70.08±1.98%[b] | 75.84±2.13%[a] | 75.36±2.15%[a] | 71.12±1.99%[b] | 75.60±2.06%[a] |

***Note**: The table shows the behaviours of laying hens. [a,b,c] are superscript, Similar superscript are not significant differ in row wise (p>0.05).*

The five freedom factors were assessed in terms of their mean percentages and variation (Table 3). Factor F1 showed a mean of 31.90% (±2.43), ranging from 30.00% to 35.00%. Factor F2 had a consistent mean of 50.00% with no variation. Factor F3 had a mean of 14.67% (±10.81), indicating high variability (0.00% to 37.00%). Factor F4 demonstrated complete consistency at 80.00% across all measurements. Factor F5 exhibited a mean value of 47.07% (±3.61), with values ranging from 40.00% to 60.00%. In summary, both F2 and F4 were entirely consistent, whereas F3 exhibited substantial variation.

The assessment of the Five Freedoms in this study paints a nuanced picture of animal welfare practices, revealing both commendable strengths and areas that clearly warrant further attention. Starting with Freedom from Hunger and Thirst (F1; mean 31.90%±2.43), the findings suggest only a moderate level of adequate nutrition and water provision a concern worth taking seriously, given that organizations like the World Organisation for Animal Health (WOAH) regard this freedom as an absolute cornerstone of animal welfare standards worldwide, and because lapses in this area are well known to carry serious consequences for animal health and productivity (Voogt et al., 2023; Ssuna et al., 2024). Freedom from Discomfort (F2), on the other hand, stood out for its perfectly consistent mean of 50.00% with zero variation, hinting at a standardized and deliberate approach to maintaining appropriate environmental conditions an approach that resonates with practices seen in countries like the Netherlands, where environmental enrichment and physical comfort are treated as non-negotiable pillars of animal welfare protocols (Voogt et al., 2023; Ssuna et al., 2024). Freedom from Pain, Injury, or Disease (F3), however, told a less reassuring story, with significant variability pointing to inconsistencies in health management practices that stand in stark contrast to the rigorous, continuous health monitoring championed by Europe's Welfare Quality Project a gap that must be bridged if meaningful improvements in overall animal welfare are to be achieved.

More encouragingly, Freedom to Express Normal Behavior (F4) reached an ideal consistency at 80.00%, reflecting a genuine and commendable commitment to allowing animals to engage in their natural behavioral repertoire, a standard that holds its own against those upheld in countries with the most advanced animal welfare frameworks.

Finally, Freedom from Fear and Distress (F5) indicated a moderate but still incomplete provision for minimizing psychological suffering mirroring a broader global conversation about moving beyond the mere absence of negative states and actively cultivating positive welfare experiences by reducing environmental and management-related stressors (Voogt et al., 2023; Ssuna et al., 2024). Taken together, these findings offer a valuable lens through which local practices can be honestly evaluated against international benchmarks, highlighting where alignment exists and where concerted efforts for improvement remain urgently needed.

| **Table 3:** Five freedom of the farm | | | |
|---|---|---|---|
| **Five freedom factors** | **Mean±Std.Deviation** | **Maximum** | **Minimum** |
| F1 | 31.90±2.43% | 35.00% | 30.00% |
| F2 | 50.00±0.00% | 50.00% | 50.00% |
| F3 | 14.67±10.81% | 37.00% | 00.00% |
| F4 | 80.00±0.00% | 80.00% | 80.00% |
| F5 | 47.07±3.61% | 60.00% | 40.00% |

| **Table 4:** Reference Table | |
|---|---|
| Overall Marks | Welfare Status |
| 0-20 | Very good |
| 20-40 | Good |
| 40-60 | Normal |
| 60-80 | Poor |
| 80-100 | Vey poor |

Source:- (Nordquist 2017).

A closer look at Table 4 brings the welfare status of each of the Five Freedoms into sharper focus. The F1 welfare status, recorded at 31.90%, lands comfortably within the 20–40% range of the reference table, making it a favorable outcome and one that reflects a reasonably adequate level of nutritional and hydration provision within the system. F2, sitting at exactly 50.00%, falls squarely within the 40–60% reference range, placing it in the normal category and suggesting that environmental conditions are being maintained at an acceptable, if not exceptional, standard within the intensive farming system. Interestingly, F3 emerges as the strongest performer across all five dimensions, with a value of just 14.67% wellwithin the 0–20% reference range earning it a very good classification and indicating that, at least in terms of pain, injury, and disease management, this system is performing at a notably high level. F4, however, stands out as the most

concerning finding; its value falling within the 60–80% reference range places it in the poor category, suggesting that the freedom to express normal behavior remains significantly compromised within this intensive farming context and deserves urgent attention. Rounding out the picture, F5 was recorded at 47.07%, which, like F2, sits within the normal 40–60% reference range, indicating a moderate but adequate degree of protection against fear and distress, though clearly leaving room for meaningful improvement.

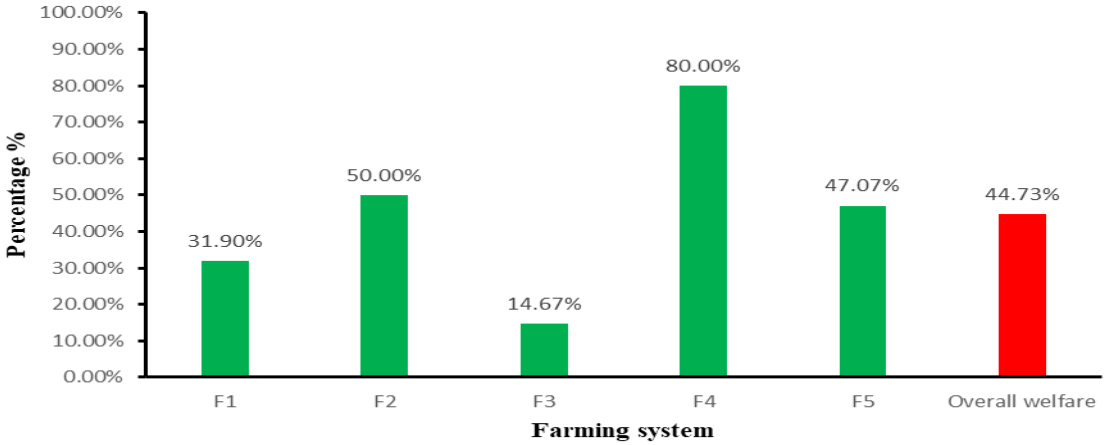


**Figure 1:** Overall welfare status of the studied farm

Figure 1 illustrates that overall welfare was measured at 44.73%, suggesting moderate adherence to welfare standards across the assessed freedoms. Globally, the Five Freedoms framework has been instrumental in shaping animal welfare standards. However, recent discourse suggests that while the Five Freedoms provide a foundational guideline, they may not encompass the full spectrum of animal welfare considerations, particularly the promotion of positive experiences. For instance, advocates for the Five Provisions/Welfare Aims paradigm, which emphasizes both minimizing negative experiences and promoting positive states (Mellor, 2016). This approach aligns with the Five Domains Model, focusing on nutrition, environment, health, behavior, and mental state. In developed countries, welfare assessments often incorporate these comprehensive models. For example, the European Welfare Quality assessment system evaluates animal welfare based on principles like good feeding, housing, health, and appropriate behavior. Such frameworks aim to provide a more nuanced understanding of animal welfare, moving beyond the limitations of the Five Freedoms. Conversely, in developing countries, including parts of South Asia, animal welfare concerns are evolving. The study note that while traditional farming practices often foster close human-animal bonds, there are knowledge and action gaps in implementing animal-friendly production methods (Parlasca et al., 2023). Economic growth and increased awareness are gradually elevating the importance of animal welfare in these regions. The low score in F3 within the studied system underscores the need for targeted interventions to address health-related welfare issues. Adopting comprehensive welfare assessment models, such as the Five Domains or the updated Five Provisions, could provide a more holistic approach to animal welfare, ensuring both the minimization of negative experiences and the promotion of positive states (Beausoleil et al., 2023).

## 4. Conclusion

Animal welfare is ensuring the well-being of animals, humane treatments, proper care and state of the animal (physical and mental health) Under this assessment, assessed the wellbeing of laying hens raised in kundasale, karandagolla poultry breeder farm the main observation was based on farm five freedom assessment and laying hens behaviours and effect of the farm welfare. Which result in finally, in this layer farm, F1 (Freedom from Hunger, Thirst, and Malnutrition) is good in this intensive farming system, because farmed hens provide adequate feed (CIC breeder layer feed), feeder buckets spaces (13 birds/bucket) water, drinker spaces (75birds/drinker) for their ages. F2 (freedom from discomfort) is normal in this farming system because of environmental conditions and housing facilities as well as litter material with a comfortable resting area. F3 (freedom from pain, injury and diseases) is very good in this farm because lower levels of lameness, sick animals and any other disease symptoms are observed in this farm. And also, rapid diagnosis and treatment for them. F4 (freedom to display the most normal pattern of behaviour) is poor in this farm because of normally using a small space ($4ft^2$) for one hen. Less proper facilities of the hen's moving. Freedom from fear and distress (F5) is normal in this farm because of hens' interaction with human occur in normally and also no more mental suffering. According to the overall 5F percentage (44.73%) this farming system is in normal welfare status, but close to good welfare category. Figure 2 explains five freedom approach farm in Sri Lanka

**Figure 2:** Five freedom approach farm.

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