Growth and Production Performance of Ring-Necked Pheasants (*Phasianus colchicus L.*) in Nuwakot District of Nepal

Saroj Sapkota[1*], Pawan Pyakurel[2*], Neena Amatya Gorkhali[1], Surya Prasad Sharma[3] and Shreeram Prasad Neopane[4]
[1]*Nepal Agricultural Research Council, Khumaltar, Nepal*
[2]*PRAYAS-Nepal, Dhading*
[3]*Institute of Agriculture and Animal Sciences, Tribhuvan University, Kritipur, Nepal*
[4]*Himalayan College of Agriculture Science and Technology, Kritipur, Nepal*
[*]*Corresponding author: sarose.sapkota@gmail.com, pyakurelpawan52@gmail.com*

Abstract

Purpose: The main purpose of this research was to analyze the effects of various non-genetic factors on growth and production parameters of Ring-necked pheasant.
Methods: This research was done in three different pheasant farms in Nuwakot district during May 2022 to June 2023. The factors included in the research were farm management practices, the sex of the bird, and their interactions. The pheasant farms selected have intensive and extensive system of rearing and were fed with commercial feed, home-made feed and supplementation of mineral mixtures. The data were analyzed using Least Squares Analysis Techniques based on the Henderson Fixed Effect Model.
Results: Both farming practices and sex differences significantly influenced body weight at various time periods. The overall mean body weight of bird at one, three, five, eight, and ten months were 159.5, 492.0, 677.0, 909.0, and 1385.0 g, respectively. Male were heavier than female at all ages. The market age of Ring-necked pheasants was determined to be 40 weeks, with an average weight of 1385.3±0.26 g.
Conclusion: The findings suggested that Ring-necked pheasants can be successfully raised in the subtropical regions of Nepal with an improved package of practices for better growth and production traits. Similarly, the factors such as production system and sex of birds had significant effect on overall production performance.

Keywords: Body weight; Feeding regime; Growth; *Kalij*; Management system

1 Introduction

The Ring-necked pheasants is a bird species belonging to the Phasianidae family, and is native to the foothills and montane forests of South Asia, including regions of India, Nepal, Bhutan, and parts of Southeast Asia (Ali & Ripley, 1987). The Ring-necked pheasants is an ecologically significant bird species in Nepal, known for its cultural value and potential economic benefits found in both wild and captivity (Ashraf, 2015). Small to big farms of Pheasants has been established across the country with three thousand Pheasants in Chure Rural Municipality, Kailali (Pant, 2023) to a larger farm with twelve thousand Pheasant birds also exists in Nepal (Poudel et al., 2023). However, there is a lack of comprehensive scientific knowledge regarding the growth, production, and egg characteristics of the Ring-necked pheasants' population in Nepal, especially with respect to farm level production. According to the information obtained from the Department of National Parks and Wildlife Conservation and Department of Livestock Services in Nepal, the Ring-necked pheasants is distributed throughout the country, including the Nuwakot district (DNPWC, 2015; DLS, 2020).
Specific information on the growth rates, age at sexual maturity, and factors influencing the

growth of the Ring-necked pheasants in the country is lacking (DLS, 2021; MoALD, 2021). Understanding the growth patterns and egg laying behavior of this species is essential for assessing its population dynamics, reproductive success, and overall scaling up for profitable enterprises. Moreover, linking this knowledge with poultry farming practices can provide information into the potential of domesticating Ring-necked pheasants for sustainable poultry production in Nepal. Scientific knowledge about growth traits, reproductive aspects and egg characteristics can give us valuable insights into the possibility of raising Ring-necked pheasants in captivity for commercial purposes, while also ensuring that the scientific research we conduct can be practically applied to the poultry farming sector across the mid-hills of Nepal. Considering these perspective, research was done with the main objective to analyze the effects of various non-genetic factors also by covering economic traits and egg characteristics on growth and production parameters of Ring-necked pheasant, *Kalij*.

2 Materials and methods

2.1 Study Location

This research was done in Nuwakot district, Nepal. Three commercial Ring-necked pheasants farm were selected with different management system for this research. These three farms were located in different Municipalities: Likhu Rural Municipality (Namaste *Kalij* Farm-Farm 1) Thansing-5; Bidur Municipality-10 (Manakamana *Kalij* Farm-Farm 2) and Coloni, Panchakanya Rural Municipality-1 (Kabilas agro farm-Farm 3), Baniyatar (Figure 1).

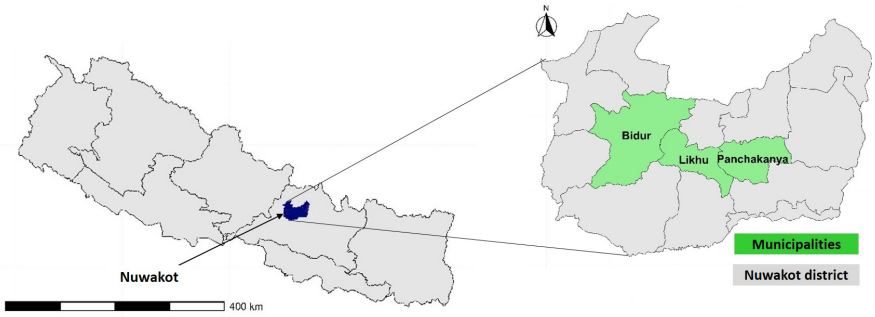

Figure 1: Map of the research area in Nuwakot District, Nepal.

2.2 Sample size, farm management and feeding system

A total of one hundred twenty Ring-necked pheasants from three different farms having various management conditions were selected. Forty Ring-necked pheasant chicks (day old) from each farm were chosen for this research.

Pheasants were fed on the same standard concentrate of chick mash consisting of 18% crude protein and 2,800 kcal ME/kg. From 8 to 18 weeks, chicks were fed a 15% crude protein and a 2,700 kcal ME/kg diet. During the laying period, hens were fed a diet containing 16% crude protein and 2,700 kcal ME/kg. Home-made ration was prepared from locally available ingredients such as maize, rice barn, mustard cake, salt and with some mineral supplementation. All chicks were vaccinated and were subjected to the various management system.

Table 1: Farm management and feeding system details.

Farm	No. of Sample birds	No. of Sample eggs	Management System	Feeding System
Farm1	40	17	Extensive	Concentrate + Home-made ration
Farm2	40	17	Semi-Intensive	Concentrate + Home-made ration
Farm3	40	17	Semi-Intensive	Concentrate ration + Nutrients and mineral additives

2.3 Growth and production traits

The growth and production related traits of Ring-necked pheasants measured in this research included weekly body weight (day old, 4, 12, 20, 32 and 40 weeks), body weight at first egg lay (BWFE), days at different egg laying percentage (5%, 10%, 20%, and 30%), and egg weight at different egg laying percentage. Egg laying percentage is important in pheasants because it directly affects the productivity and profitability of egg production systems as well as it helps in selection of female pheasants to be the stock of the flock. Three types of feed (Commercial Broiler, Commercial Layers, and Home-made with supplement) were fed according to age group of Pheasants.

2.4 Data analysis and statistical model

All the collected data were entered into the computer using MS- Excel and converted into text documents i.e. Text (MS-DOS). To study the main causes of variation and effects of non-genetic factors on growth, egg production, and egg biometry traits as well as to overcome the difficulty of disproportionate subclass numbers, data were analyzed statistically using Fixed Effect Model Least Squares, and Maximum Likelihood Computer Program PC-2 (Harvey, 1990) based on C. R Henderson Model. The statistically significant means were compared using the Duncan's Multiple Range Test (DMRT) computer software suggested by Duncan (1955).
Production, reproduction and egg traits were analyzed using a fixed effect model (the number of factors used in the model may vary with the traits considered).

$$Y_{ij} = \mu + a_i + b_j + (ab)_{ij} + e_{ijk}$$

where, Y_{ij} = Weight of chicks from hatch to 4 weeks to 40 weeks of age, or body weight at first lay or egg traits, µ = overall mean, a_i = effect of ith farm management (i= 1, 2, 3), b_j = effect of sex (i=1,2), a*b_{ij} = Effect of interaction between farm and sex, e_{ijk} = random element (error mean) assumed to be normally and independently distributed among the sampled population.

3 Results

3.1 Growth performance of Ring-necked pheasants

The overall least square mean of day-old chicks, 4 weeks, 12 weeks, 20 weeks, 32 weeks and 40 weeks of Ring-necked pheasants was 16.6±0.20, 159.47±0.21, 492.16±0.97, 676.99±0.14, 909.3±0.12, and 1385.3±0.26 g, respectively (Table 2). Weight of day-old chicks, chicks at four weeks and 40 weeks of age were significantly influenced ($p < 0.05$) by management of farm whereas Pheasants from four to forty weeks age were significantly differed ($p < 0.05$) for sex of the bird (Table 2). Farm 2, with semi-intensive management and a homemade ration plus commercial concentrate, had performed the highest day-old chick weight compared to Farm 1

(extensive management) and Farm 3 (semi-intensive with commercial concentrate and supplements) (Table 2).

Table 2: Least Squares Means (LSM) and Standard Errors (SE) for different factors across various time frames.

Factors	**n**	**LSM±SE (g)**					
		Day Old	**4 Weeks**	**12 Weeks**	**20 Weeks**	**32 Weeks**	**40 Weeks**
Overall Mean	120	16.6 ± 0.20	159.47 ± 0.21	492.16 ± 0.97	676.99 ± 1.04	909.3 ± 0.12	1385.3 ± 0.26
Farm							
1	40	16.69 ± 0.34^{b}	170.11 ± 0.36^{a}	480.71 ± 0.21	691.41 ± 0.17	876.11 ± 0.12	1276.50 ± 0.21^{c}
2	40	17.93 ± 0.37^{a}	140.15 ± 0.32^{b}	512.47 ± 0.13	656.00 ± 0.15	856.02 ± 0.11	1404.62 ± 0.31^{b}
3	40	16.75 ± 0.25^{b}	168.23 ± 0.31^{a}	486.12 ± 0.23	689.10 ± 0.32	932.60 ± 0.25	1487.27 ± 0.27^{a}
LS		$p < 0.05$	$p < 0.05$	NS	NS	NS	$p < 0.05$
Sex of Bird							
Male	60	–	163.58 ± 0.29	544.32 ± 0.10	779.48 ± 0.12	957.40 ± 0.14	1599.82 ± 0.17
Female	60	–	155.41 ± 0.28	441.99 ± 0.10	578.59 ± 0.12	862.69 ± 0.14	1179.11 ± 0.17
LS		–	$p < 0.05$	$p < 0.05$	$p < 0.05$	$p < 0.05$	$p < 0.05$

Note: LSM- Least square mean, SE- Standard error of the means, n- Number of sample observations, LS – Level of Significance, NS- Not Significant. Means having different superscripts in the same column are significantly different at $p < 0.05$.

3.2 Body weight of pheasant at first egg lay (BWFE)

The result of this research reflected the fact that the overall mean body weight at first egg (BWFE) of Ring-necked pheasants was 1385.30±0.26 g (Table 3). Different management systems under this study significantly affected (pj0.05) BWFE. Accordingly, the highest BWFE was observed in Farm 3 with 5 and 15.5% more weight than Farm 2 and Farm 1, respectively. Farm 2 and Farm 3 had semi-intensive management system with supplement feeding practices where birds received both access to outdoor areas and regular feed supplementation (Table 3).

Table 3: Table showing the BWFL (Body Weight at Finished Level) of different farms with mean values and significance.

Factors	n	BWFL (LSM±SE) (g)
Overall Mean		1385.30±0.26
Farm		
1	40	1276.50 ± 0.16^{c}
2	40	1404.62 ± 0.19^{b}
3	40	1474.77 ± 0.25^{a}
Level of Significance		$p < 0.05$

Note: BWFL – Body Weight at First Lay, LSM- Least square mean, SE- Standard error of the means, n- Number of sample observations, NS- Not Significant. Means having different superscripts in the same column are significantly different at $p < 0.05$.

3.3 Age of pheasant at different egg laying conditions

The mean age of Ring-necked pheasants at different egg-laying conditions are presented in Figure 2. Ring-necked pheasants laid 5% of eggs in 314 days and laid 10%, 20%, and 30% of eggs simultaneously in 322 days, 330 days, and 343 days, respectively (Figure 2). This well showed the relationship between egg-laying percentage and egg-laying days of Ring-necked pheasants. The egg laying percentage for Farm 2 and Farm 3 showed an earlier onset as compared to Farm 1 ($p < 0.05$).

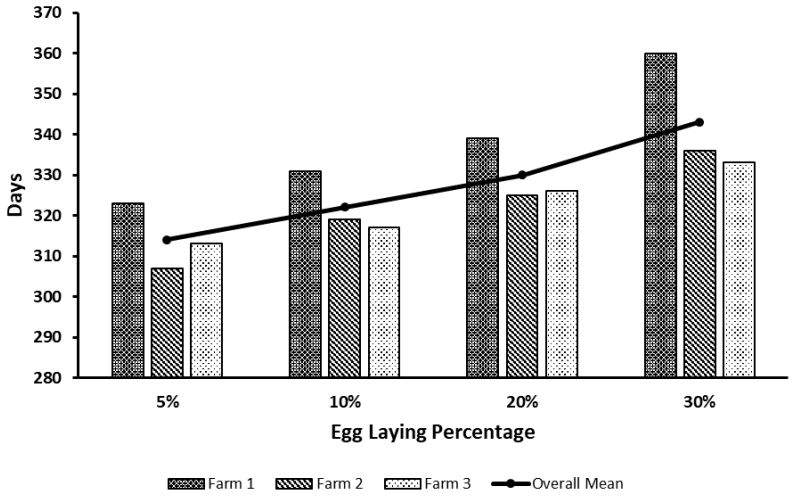

Figure 2: Mean age of Ring-necked pheasants at different egg-laying conditions in different management systems in different farms of Nuwakot district.

3.4 Egg weight at different egg-laying conditions

The mean weight of Ring-necked pheasant eggs varied across different egg-laying conditions (Table 4). Accordingly, the mean egg weights corresponding to 5%, 10%, 20%, and 30% laying rates were 25.79 g, 26.43 g, 27.21 g, and 28.31 g, respectively (Table 4). These findings revealed a clear trend of increasing egg weight with higher egg-laying percentages.

Table 4: Effect of Different Feed Levels on Egg Lay Across Farms.

Farm	**Egg weight at different egg-laying (g)**			
	5 %	**10 %**	**20 %**	**30 %**
Overall Mean	25.79	26.43	27.22	28.31
Farm	NS	$p < 0.05$	NS	$p < 0.05$
1	25.81	28.28^{a}	27.38	28.83^{a}
2	25.36	24.32^{c}	26.07	26.78^{b}
3	26.20	26.69^{b}	28.22	29.33^{a}

Note: LSM- Least square mean, SE- Standard error of means, n- Number of sample observations, NS- Not Significant. Means having different superscripts in the same column are significantly different at ($p < 0.05$).

4 Discussion

Farm 2, with semi-intensive management and a homemade ration plus commercial concentrate as a supplement, showed the highest day-old chick weight. This could be due to the fact that chicks in Farm 2 were hatched from larger eggs. This result could be linked to the fact that, as measured during the research, the pheasant eggs in Farm 2 were generally larger, providing more nutrients for embryonic development (Iqbal et al. 2023). Along with, Caglayan and Inal (2006) reported about increasing chick weight with increasing egg weight for quails and documented the same for pheasants, which supports the findings of this research. However, Farm 3 showed the highest 40 weeks weight compared to Farm 1 and Farm 2. This may be solely attributed to their rearing in a semi-intensive system, where improved care, effective management practices, and the provision of nutrient and mineral supplements could well contribute to their enhanced performance which is in the line of research report by Hafez and Boulianne (2017). In other hand, male Pheasants continued to exhibit heavier body weight across various growth stages than female pheasants from 4 weeks to 40 weeks of age perhaps due to their inherent genetic differences that promote faster growth rates, greater muscle development, and more efficient feed conversion (Havenstein et al. 2003). These physiological and hormonal factors drive sexual dimorphism in growth performance. This finding was well matched with the research findings of Sapkota et al. (2020) and Gorkhali and Bhusal (2015) during their study on Indigenous *Sakini*.
In addition, Farm 2 and Farm 3 had semi-intensive management system with supplement feeding practices where birds received both access to outdoor areas and regular feed supplementation, ensuring a consistent intake of nutrients needed for optimal growth whereas Farm 1 had extensive management system where birds forage naturally over larger areas with various types of feeds (nutrition might not be balanced) which is in the line with the research findings of Nakkazi et al. (2015). Additionally, more movement (walking, flying, foraging) in extensive system of production in Farm 1 having lower weight, as it burns more calories, leaving less energy for body weight gain (Sonaiya & Swan, 2007) at later stages of growth.
Moreover, Farm 2 and 3 with intensive management with feed supplement had shorter days to reach peak egg laying (up to 30%) with respect to Farm 1 with extensive management system. The reproductive performance of this species can vary which was confirmed by Krystianiak et al. (2007). Increasing egg weight with later stages of egg-laying, suggests that as the laying cycle progresses, hens may allocate more resources toward egg formation, resulting in heavier eggs. Such a pattern could be attributed to physiological maturation and improved nutritional status as laying advances. The observed trend is consistent with the findings of Suchy et al. (2007), as the authors had reported about an increase in egg weight with advancement of laying.

5 Conclusion

Results of our research revealed that the growth and production performance of Ring-necked pheasants were significantly influenced by farm management practices and the sex of the birds. Semi-intensive management systems, supplemented with additional feeding resources, consistently produced superior growth rates, had an earlier sexual maturity, and an improved egg-laying performance. These findings highlight the importance of management strategies in optimizing the productivity of Ring-necked pheasants under farmed conditions.

Acknowledgement

The authors would like to sincerely thank the farm owners for their valuable support and cooperation throughout the study. Their assistance in providing access to their facilities, sharing management practices, and allowing detailed data collection was instrumental in the successful completion of this research. We are deeply grateful for their commitment and contributions to this work.

Author's contribution

S. Sapkota, P. Pyakurel, and S.P. Neopane conceptualized the study, designed the methodology, collected and interpreted data, and drafted the manuscript. N.A. Gorkhali and S. P. Sharma contributed to data analysis, created tables and graph, and participated in manuscript editing and finalization. All authors reviewed and approved the final version.

Conflict of interest

The authors declare that there are no conflicts of interest related to the preparation of this manuscript, or publication of this research work.

References

Ali, S., Ripley, S.D., & Dick, J.H. (1987). Compact handbook of the birds of India and Pakistan: together with those of Bangladesh, Nepal, Bhutan and Sri Lanka.

Ashraf, S. (2015). Studies on Growth Performance, Morphology, Reproductive Traits and Behavioral Aspects of Ring Necked Pheasants in Captivity (Unpublished PhD Dissertation), Wildlife and Ecology University.

Caglayan, T., & Inal, S. (2006). Effect of egg weight on hatchability, growth and survival rate in Japanese quail. Eurasian Journal of Veterinary Sciences, 22(1), 11-19.

DLS. (2020). Annual Progress Report. Department of Livestock Services. Ministry of Agriculture and Livestock Services, Singhadurbar, Kathmandu.

DLS. (2021). Annual Progress Report. Department of Livestock Services. Ministry of Agriculture and Livestock Development, Singhadurbar, Kathmandu.

DNPWC. (2015). Annual Progress Report. Department of National Parks and Wildlife Conservation. Ministry of Forestry and Soil Conservation, Singhadurbar, Kathmandu.

Duncan, D. B. (1955). Multiple range and multiple F tests. Biometrics, 11(1), 1-42.

Gorkhali, N.A., & Bhusal, R. (2015). Evaluation of growth performance of local poultry "Sakini" raised under intensive management system. Nepalese Journal of Animal Science, 1 (1), 11-19.

Hafez, M. H., & Boulianne, M. (2017). Poultry nutrition and feeding. In Hafez and Boulianne's Avian Disease Manual, 65-79.

Harvey, W.R. (1990). User's Guide for LSMLMW and MIXMDL PC-2 Version. Mixed model least-square and maximum likelihood computer program, Ohio State University, Columbus, Ohio, U.S.A.

Havenstein, G.B., Ferket, P.R., Scheideler, S.E., & Rives, D.V. (2003). Carcass composition and yield of 1991 vs 1957 broilers when fed "typical" 1957 and 1991 broiler diets. Poultry Science, 73, 1795-1804.

Krystianiak, S., Kontecka, H., Nowaczewski, S., & Rosiński, A. (2007). Laying characteristics of one-and two-year old pheasants (*Phasianus colchicus*, L.). Folia Biologica (Kraków), 55(1-2), 65-72.

MoALD. (2021). Statistical Information for Nepalese Agriculture. Ministry of Agriculture and Livestock Development, Singhadurbar, Kathmandu.

Nakkazi, C., Kugonza, D.R., Kayitesi, A., Mulindwa, H.E., & Okot, M.W. (2015). The effect of diet and feeding system on the on-farm performance of local chickens during the early

growth phase. Livestock Research for Rural Development, 27(10), 204.

Pant, D.R. (2023, March 23). Pheasant farms thrive in western Nepal on rising demand. The Kathmandu Post. https://kathmandupost.com/money/2023/03/22/pheasant-farms-thrive-in-western-nepal-on-rising-demand.

Poudel, M., Karna, M., & Gompo, T. (2023). Study on Management Status and Disease aspects of Pheasant (*Phasianus colchicus*) of Kathmandu Valley, Nepal. Nepalese Veterinary Journal, 38(1), 88–97. https://doi.org/10.3126/nvj.v38i1.55849.

Iqbal, J., Khan, S.H., Mukhtar, N., & Ahmad, T. (2023). Impact of egg size on the quality of eggs, chicks, and post hatch overview of offspring during the mid-stage of yield (45th week) in Hubbard broiler breeders. Advancements in Life Sciences, 10(3), 368-37.

Sapkota, S., Kolakshyapati, M.R., Devkota, N.R., Bhattarai, N., & Gorkhali, N.A. (2020). Selective Breeding to Improve Productive and Reproductive Performances and Survivability of Indigenous Sakini Chicken. Journal of Nepal Agricultural Research Council, 6, 62–69.

Sonaiya, E.B., & Swan, S. (2007). Small scale poultry production: technical guide.

Suchy P., Strakova E., & Vitula F. (2008). The effect of a diet supplemented with l-carnitine on egg production in pheasant (*Phasianus colchicus*). Czech Journal of Animal Science, 53, 31–35.

Correct citation: Sapkota, S., Pyakurel, P., Gorkhali, N. A., Sharma, S. P., & Neopane, S.P. (2025). Growth and Production Performance of Ring-Necked Phesants (*Phasianus colchicus L.*) in Nuwakot District of Nepal. *Jagriti—An Official Journal of Gandaki University*, 2(1), 10–17.