

**OSTRICH (*Struthio camelus*) PRODUCTION THROUGH
NUTRITION, BEHAVIOR ANALYSIS AND IMPROVING
REPRODUCTIVE PERFORMANCE UNDER THE
FARMING CONDITION IN BANGLADESH**

A Dissertation

Submitted By

KHANDOKER TOUHIDUL ISLAM

Registration No.: 2005166

In partial fulfilment of the requirements for the degree of

Doctor of Philosophy

In

Animal Nutrition



Department of Animal Science and Nutrition

Hajee Mohammad Danesh Science and Technology University

Dinajpur-5200 Bangladesh

AUGUST, 2025



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Preface

This dissertation, entitled "Productive and Reproductive Performances of Ostrich in Bangladesh," is the outcome of dedicated research carried out from 2021 to 2024 in the Department of Animal Science and Nutrition, Hajee Mohammad Danesh Science and Technology University (HSTU), Dinajpur, Bangladesh. The study was conducted as part of the partial fulfillment of the requirements for the degree of Doctor of Philosophy.

This research project was generously funded by The Strengthening of Poultry Research and Development Project, Poultry Research Centre (PRC), Bangladesh Livestock Research Institute (BLRI), Savar, Dhaka, Bangladesh. Their support enabled an in-depth exploration of a relatively new and promising field in the country's livestock sector.

The major focus areas of the study included ostrich production systems, reproductive behavior, incubation and hatching techniques, and feeding management. Specific objectives were to investigate the problems and prospects of ostrich farming in Bangladesh, evaluate the effect of dietary supplementation with amino acids such as lysine and methionine on performance and economics, with the behavioral patterns, and assess the quality of ostrich meat as well as the success of artificial incubation techniques in local environmental conditions.

It is hoped that the findings of this dissertation will serve as a valuable resource for ostrich farmers, researchers, and policymakers, and contribute to the advancement of sustainable ostrich farming practices in Bangladesh.

The author

Declaration

I hereby declare that the dissertation entitled “Productive and Reproductive Performances of Ostrich in Bangladesh” is the result of my own original research work. It has been written and composed solely by me under the academic supervision of Professor Dr. Ummay Salma (**Supervisor**), Professor Dr. Abdul Gaffar Miah (**Co-Supervisor**), and Dr. Md. Sazedul Karim Sarker (**Supervisory Team Member**).

This PhD research was carried out with the financial support of “The Strengthening of Poultry Research and Development Project,” Poultry Research Centre (PRC), Bangladesh Livestock Research Institute (BLRI), Savar, Dhaka, Bangladesh. The experimental work and laboratory investigations were conducted at various facilities, including the Bangladesh Livestock Research Institute (BLRI), The Advanced Avian Research Farm, the Laboratory of Genetics and Animal Breeding, the Laboratory of Animal Science and Nutrition at HSTU, and the Bangladesh Council of Scientific and Industrial Research (BCSIR), Dr. Qudrat-i-Khuda Road, Dhanmondi, Dhaka-1205, Bangladesh.

To the best of my knowledge, this dissertation is an original contribution to the field, except where due references have been made to the work of others. All such contributions have been properly cited and are listed in the reference section. Every form of support and assistance received during the course of this research is sincerely acknowledged and deeply appreciated.

I also affirm that this work has not been submitted in any form to any other institution for the award of any other degree or diploma.

The author

Certification

This is to certify that the dissertation entitled “Productive and Reproductive Performances of Ostrich in Bangladesh,” submitted by the examinee bearing Registration No.: 2005166 of the Department of Animal Science and Nutrition, Hajee Mohammad Danesh Science and Technology University (HSTU), Dinajpur, has been carried out under my direct supervision in partial fulfillment of the requirements for the degree of Doctor of Philosophy (PhD) in Animal Science and Nutrition.

To the best of my knowledge, the work embodied in this dissertation is original and has not been submitted, either in part or in full, to any other institution or university for the award of any degree or diploma. It is a unique contribution to the field of animal science and reflects the candidate’s dedication and scholarly effort.

Professor Dr. Ummay Salma

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Dedication

To my beloved parents,

For their unconditional love, sacrifice, and support.

To my brothers and sisters,

Who took on the role of foster parents since I was 55 days old,

and whose care shaped my early life.

To my wife and daughters whom are continuous support

to fulfil the PhD degree.

To those who have always worked for the betterment of farmers,

who valued experiential learning,

and whose wisdom continues to inspire and inform.

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The author expresses heartfelt gratitude to Professor Dr. Md. Rashedul Islam, Chairman, Department of Genetics and Animal Breeding, for his invaluable academic guidance and unwavering support throughout the research journey. Sincere appreciation is also extended to Dr. Mst. Afroja Khatun, Department of Dairy and Poultry Science; Dr. Md. Kamruzzaman, Associate Professor, Department of Dairy and Poultry Science; Dr. Md. Hosne Mobarak Mithu, Associate Professor, Md. Khairul Islam, Lecturer, Department of Genetics and Animal Breeding; Dr. Md. Ahsan Habib Pramanik, Ph. D. Fellow, Department of Genetics and Animal Breeding and Professor Dr. Mohammad Saiful Islam, Department of Medicine, Surgery and Obstetrics, for their expert insights, constructive feedback, and continued encouragement.

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The author also rendering heartiest thankfulness to some Print media like Daily Naya diganta, Daily Prothom ALo, Kalbela News, Daily Sangbab as well as some electronic media like Shomoy tv, 71 tv, Jamuna tv, DBC News, Nagoric tv, News 24 to broadcast the research results.

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As this research explored a novel topic in the context of Bangladesh, the author gratefully acknowledges the many individuals who visited the research site and, although unknown personally to the author, offered kind words and encouragement. These gestures served as a source of motivation and are deeply appreciated.

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The author

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List of Abbreviations

Abbreviation	Full Form
ACI	Advanced Chemical Industries
ADG	Average Daily Gain
AI	Artificial Insemination
ANOVA	Analysis of Variance
BBS	Bangladesh Bureau of Statistics
BCRDV	Baby Chick Ranikhet Disease Vaccine
BDT	Bangladeshi Taka
BLRI	Bangladesh Livestock Research Institute
BRAC	Bangladesh Rural Advancement Committee
BUFFALO	Bovine Unit for Feed, Fertility and Output
CPCSEA	Committee for the Purpose of Control and Supervision of Experiments on Animals
CRD	Chronic Respiratory Disease
DNA	Deoxyribonucleic Acid
DoF	Department of Fisheries
FAO	Food and Agriculture Organization
FCR	Feed Conversion Ratio
FGDs	Focus Group Discussions
GDP	Gross Domestic Product
ha	Hectare
HSD	Honestly Significant Difference
kg	Kilogram
KIIs	Key Informant Interviews
LBP	Livestock Breeding Policy
NGO	Non-Governmental Organization

PCR	Polymerase Chain Reaction
PRC	Poultry Research Centre
RDV	Ranikhet Disease Vaccine
RH	Relative Humidity
SDG	Sustainable Development Goal
SEM	Standard Error of Mean
SPSS	Statistical Package for the Social Sciences
SWOT	Strengths, Weaknesses, Opportunities, Threats
USD	United States Dollar
VIF	Variance Inflation Factor
VS	Veterinary Surgeon

ABSTRACT

Ostrich farming is gaining increasing attention in Bangladesh as an alternative and profitable enterprise to traditional livestock systems. The ostrich (*Struthio camelus*), known for its fast growth, high feed efficiency, lean red meat, and large eggs, holds considerable potential for commercial-scale farming. However, the development of ostrich farming in Bangladesh is constrained by limited scientific knowledge, a lack of species-specific management practices, and suboptimal reproductive outcomes. This dissertation was designed to comprehensively assess the biological, behavioral, nutritional, and reproductive parameters of ostriches reared under semi-intensive farming systems in Bangladesh, with a view to identifying strategies for improvement and long-term sustainability. The study consisted of six integrated components. First, a baseline survey identified the major bottlenecks and opportunities within the emerging ostrich farming sector. Second, the effects of dietary methionine and lysine supplementation on growth performance and survivability of ostrich chicks were examined. Third, behavioral patterns and social interactions of captive ostriches were studied to better understand ethological needs under farm conditions. Fourth, detailed carcass analysis was performed to evaluate meat yield and nutritional composition. Fifth, ostrich eggs were examined for physical characteristics and nutrient content. Sixth, reproductive challenges and hatchability under artificial incubation were investigated. Results revealed that feed cost, breeder performance, technical limitations, and lack of veterinary support are critical constraints. Methionine (0.2%) and lysine (0.15%) supplementation significantly improved weight gain and feed conversion ratio ($p < 0.05$). Ethological observations identified clear diurnal activity cycles, mating behaviors, and social hierarchies that influence welfare and productivity. Meat analysis showed high protein (22.4%) and low fat (1.8%) levels, and eggs exhibited large size, strong shells, and nutrient-dense yolk. Hatchability through artificial incubation reached 68.2%, although early embryonic mortality remained a key concern. This research provides foundational knowledge that supports scientific management of ostriches in subtropical climates. It offers practical recommendations for enhancing productivity and reproductive success, while informing policy and extension strategies for promoting ostrich farming as a viable agribusiness in Bangladesh.

Keywords: Ostrich farming, methionine, lysine, growth, ethology, meat quality, egg nutrition, hatchability, Bangladesh

Published articles

The following research findings presented in this dissertation have been published in peer-reviewed scientific journals:

1. **Chapter 3: Islam, K. T.**, Sarker, M. S. K., Salma, U., Miah, A. G., and Sharmin, F. (2022). Problems and prospects of ostrich (*Struthio camelus*) production in Bangladesh. *International Journal of Natural and Social Sciences*, 9(4), 51–58.
2. **Chapter 4: Islam, K. T.**, Sarker, M. S. K., Salma, U., Miah, A. G., and Sharmin, F. (2023). Dietary effect of methionine and lysine on growth performance of ostrich chicks in Bangladesh. *IOSR Journal of Agriculture and Veterinary Science*, 16(11, Ser. I), 1–6.