

# Encyclopaedia of Broiler Breeder Production

## Production, Feeding and Management Techniques

Properly managing the sexual maturation of the modern broiler breeder female is critical to obtaining a high peak and large overall number of quality hatching eggs. The most critical management period for broiler breeders is from photo stimulation (lighting) to peak production. Management deficiencies during this period are always cost-effective and often cannot be compensated for at a later stage. Broiler breeders require nutrients for maintenance, growth and egg production. Maintenance needs are met first and until that happens, growth and egg production is virtually declined. Adjusting the feed allotment throughout the lay cycle controls bird nutrient intake. Intake must be strictly controlled to prevent hens from becoming overweight resulting in decreased egg production. Flocks must be uniform in weight and body condition in order to properly allocate feed allotments. Uniformity is especially critical at the time of lighting. Flocks that vary excessively in uniformity are nearly impossible due to proper management from a feed allotment standpoint. This encyclopaedia is carefully edited and designed in as a such way that the presentation of the subject is clearly understandable.

### About the Editor

**Michael Youn** has over 12 year of industry experience in Feed Manufacturing and Quality Assurance. He has developed and implemented Quality Assurance Programs and conducted audits at feed mills in the United States and Mexico. His area of specialization is broiler breeder reproductive physiology and nutrition. He has published more than 280 research, review and popular articles, two books on poultry production and a number of pamphlets on poultry science.

### ANMOL PUBLICATIONS PVT. LTD.

Regd. Office: 4360/4, Ansari Road, Daryaganj, New Delhi-110002 (India)  
Ph.: 23278000, 23261597, 23286875, 23255577 • Fax: 91-11-23280289  
Email: anmolpub@gmail.com Visit us at: [www.anmolpublications.com](http://www.anmolpublications.com)

Branch Office: No. 1015, 1st Main Road, BSK IIIrd Stage  
IIIrd Phase, IIIrd Block, Bengaluru-560 085 (India)  
Tel.: 080-41723429 • Fax: 080-26723604  
Email: [anmolpublicationsbangalore@gmail.com](mailto:anmolpublicationsbangalore@gmail.com)



(Set of 3 Vols.)

ISBN 978-81-261-5074-8



1

Michael Youn

Encyclopaedia of  
Broiler Breeder Production



# Encyclopaedia of Broiler Breeder Production

## Production, Feeding and Management Techniques

**Michael Youn**  
Editor

Encyclopaedia of  
**Broiler Breeder Production**  
Production, Feeding and Management Techniques

Encyclopaedia of  
**Broiler Breeder Production**  
Production, Feeding and  
Management Techniques

---

VOLUME 1: SCIENTIFIC POULTRY PRODUCTION AND NUTRITION

---

Michael Youn  
*Editor*

**ANMOL PUBLICATIONS PVT. LTD.**  
NEW DELHI-110 002 (INDIA)



## ANMOL PUBLICATIONS PVT. LTD.

**Regd. Office:** 4360/4, Ansari Road, Daryaganj,  
New Delhi-110002 (India)

**Tel.:** 23278000, 23261597, 23286875, 23255577

**Fax:** 91-11-23280289

**Email:** anmolpub@gmail.com

**Visit us at:** www.anmolpublications.com

**Branch Office:** No. 1015, 1st Main Road, BSK IIIrd Stage  
IIIrd Phase, IIIrd Block, Bengaluru-560 085 (India)

**Tel.:** 080-41723429 • **Fax:** 080-26723604

**Email:** anmolpublicationsbangalore@gmail.com

Encyclopaedia of Broiler Breeder Production: Production, Feeding and  
Management Techniques

Volume 1: Scientific Poultry Production and Nutrition

© 2013

ISBN: 978-81-261-5074-8 (Set)

**Editor:** Michael Youn

No part of this publication may be reproduced, stored in a retrieval system or transmitted in any form or by any means, electronic, mechanical, photocopying, recording, scanning or otherwise without prior written permission of the publisher.

Reasonable efforts have been made to publish reliable data and information, but the authors, editors, and the publisher cannot assume responsibility for the legality of all materials or the consequences of their use. The authors, editors, and the publisher have attempted to trace the copyright holders of all material in this publication and express regret to copyright holders if permission to publish has not been obtained. If any copyright material has not been acknowledged, let us know so we may rectify in any future reprint.

*In arrangement with Koros Press Limited, UK*

## Contents

<i>Preface</i>	<i>vii</i>
<b>1. Introduction</b>	<b>1</b>
Managing Today's Broiler Breeder Female • Broiler Breeders • Challenge Feeding • Male Aggression in Broiler Breeders • Pre-Breeder Diets • Proper Brooder Management • Time to Feed Your Breeders	
<b>2. Poultry Farming</b>	<b>29</b>
Techniques • History • United States • Yarding • Intensive Chicken Farming • Issues with Poultry Farming • Identifying Broiler Breeder Management-Nutrition Interactions To Optimise Chick Production • Broiler Breeders: Managing the Paradox between Reproduction and Growth	
<b>3. Broiler Breeder Nutrition and Management</b>	<b>59</b>
Genetics, Nutrition and Reproduction • Feeding Programmes for Yield-Type Broiler Breeders • Dietary Protein and Metabolisable Energy for Broiler Breeder Males • Body Weight in Broiler Breeder Males • Feed Processing—Impacts on Nutritive Value and Hygienic Status in Broiler Feeds • Hygienic Feed Preparation • Role of Broiler Breeder Genetics on Breeder Chick Quality and Sensitivity to Overfeeding • Daylength for Broiler Breeders – Have We Got it Right?	
<b>4. Limiting Ovarian Development to Maximise Chick Production in Broiler Breeders</b>	<b>91</b>
Broiler • Leptin Receptor in the Chicken Ovary: Potential Involvement in Ovarian Dysfunction of Ad Libitum-fed Broiler Breeder Hens • Chicken • Breeding • Poultry Farming • Chicken Eggs as Food • Drinking and Feeding Systems • Codaf • Euro Agro Products • Roxell	

<b>5. The Problem of Floor Eggs</b>	<b>139</b>
Nesting Behaviour in Hens • Correcting Inappropriate Nesting Behaviour • Achieving and Maintaining Fertility in Broiler Breeders • Feed Restriction Significantly Alters Lipogenic Gene Expression in Broiler Breeder Chickens • Managing Small Poultry Flocks	
<b>6. Poultry Feeds and Feeding</b>	<b>163</b>
Definitions and Terms Used • Nutritional Requirements of Poultry • Commercial Nutrient Sources • Brooding and Growing Chicks and Poult • Poultry Health Management for Commercial Poultry • Diagnosis of Poultry Disease • Hatching Eggs and Incubation • Other Factors Affecting Incubation • Fumigation of Incubators • Animal Welfare Problems in Chickens and Other Poultry Caused by Single Trait Genetic Selection for Meat and Egg Production • Reproductive Responses to Sel-Plex® Organic Selenium in Male and Female Broiler Breeders: Impact on Production Traits and Hatchability	
<b>7. Role of Dietary Selenium</b>	<b>216</b>
Perivitelline Sperm Hole Assay • Reproduction • Ovulation • Induction and Suppression	
<b>8. Feeding Broiler Breeders for Chick Quality</b>	<b>247</b>
Nutrient Levels in Broiler Breeder Feeds • The Influence of Feed Allocation on Chick Quality • Broiler Feeding: Mash or Pellet? • Mash or Pellet? The Question of Genetics • Average Power Consumption in French Feed Factories • Mash or Pellet? The Question of Housing conditions-Human Protection • The Effect of Low-Density Diets on Broiler Breeder Development and Nutrient Digestibility During the Rearing Period • Effect of Maternal and Dietary 25-OH Vitamin D3 on Broiler Production and Immunity	
<i>Bibliography</i>	<b>265</b>
<i>Index</i>	<b>269</b>

## Preface

Poultry farming is the practice of raising domesticated birds such as chickens, turkeys, ducks, and geese, as a subcategory of animal husbandry, for the purpose of farming meat or eggs for food. More than 50 billion chickens are raised annually as a source of food, for both their meat and their eggs. Chickens raised for meat are called broilers, whilst those raised for eggs are called laying hens. In total, the UK alone consumes over 29 million eggs per day. Some hens can produce over 300 eggs a year. Chickens will naturally live for 6 or more years. After 12 months, the hen's productivity will start to decline. This is when most commercial laying hens are slaughtered.

The majority of poultry are raised using intensive farming techniques. According to the Worldwatch Institute, 74 percent of the world's poultry meat, and 68 percent of eggs are produced this way. One alternative to intensive poultry farming is free range farming. Friction between these two main methods has led to long term issues of ethical consumerism. Opponents of intensive farming argue that it harms the environment and creates health risks, as well as abusing the animals themselves. Advocates of intensive farming say that their highly efficient systems save land and food resources due to increased productivity, stating that the animals are looked after in state-of-the-art environmentally controlled facilities. A few countries have banned cage system housing, including Sweden and Switzerland. Consumers can still purchase lower cost eggs from other countries' intensive poultry farms.

Poultry breeding remains largely based on classical quantitative genetics. In essence, pedigree broiler candidates are full-fed nutritionally-dense and properly balanced diets to allow individuals that have the greatest potential to utilise crude protein (CP) and metabolisable energy (ME) to grow fast, convert feed efficiently, and yield well to become apparent by their performance. Thus, broiler strains are often selected on high-protein, high-energy diets.

Selection on nutrient dense diets apparently necessitates nutrient-dense diets in order for the progeny to fully express their genetic potential. An excellent example of the relationship between genetic



- Sainsbury, D.: *Poultry Health and Management*, Blackwell Science, US, 2000.
- Salatin, J.: *Pastured Poultry Profits*, Polyface, Swoope, Va., 1993.
- Sainsbury, D.: *Poultry Health and Management*, Blackwell Scientific, London, U.K., 1992.
- Scanes, C.G. & Brant, G. & Ensminger, M.E.: *Poultry Science*, Pearson Prentice Hill, New Jersey, 1992.
- Schrijver, R.S. & Koch, G.: *Avian Influenza*, Springer, UK, 2005.
- Sim, J. and Sunwoo, H.H.: *The Amazing Egg: Nature's Perfect Functional Food for Health Promotion*, Department of Agricultural, Food and Nutritional Science, University of Alberta, Edmonton, Alberta, Canada, 2006.
- Sim, J.S. & Nakai, S & Guenter, W.: *Egg Nutrition and Biotechnology*, CABI Publishing, NY, 2000.
- Stadelman, W.J. & Cotterill, O.J.: *Egg Science and Technology*, Food Products Press, Imprint of Haworth Press, New York, London, 1995.
- Starck, J.M. & Ricklefs, R.E.: *Avian Growth and Development*, Oxford University Press, New York, 1998.
- Stephen F. Strausberg: *From Hills and Hollers: Rise of the Poultry Industry in Arkansas*, Arkansas Agricultural Experiment Station, Fayetteville, 1995.
- Tullett, S.G.: *Poultry Science Symposium Number 22*. Butterworth-Heinemann, NJ, 1991.
- Watson, R.: *Eggs and Health Promotion*, Iowa State Press, UK, 2002.
- Weeks, C & Butterworth, A.: *Measuring and Auditing Broiler Welfare*, CABI, UK, 2004.
- Whitehead, C.C.: *Bone Biology and Skeletal Disorders in Poultry*, Carfax Publishing Company, U.K., 1992.
- Wiseman, J. & Garnsworthy, P.C.: *Recent Developments in Poultry Nutrition*, University Press, India, 1999.
- Yamamoto, T. & Juneja, L.R. & Hatta, H.: *Hen Eggs: Basic and Applied Science*, CRC Press, Delhi, 1996.

## Index

### A

- Adult Breeders, 27, 258.
- Amino Acids, 20, 73, 76, 165, 166, 167, 168, 169, 172, 248.
- Animal Welfare Network, 5.
- Antibiotics, 12, 39, 41, 42, 260, 261, 264.
- Aspergillosis, 115, 188.
- Avian Influenza, 44, 115, 179, 186.
- Avian Leukosis, 115.

### B

- Bell Drinkers, 122.
- Biotin Deficiency, 192.
- Body Composition, 23, 52, 144, 145.
- Botulism, 115, 185.
- Breeding, 5, 6, 7, 8, 11, 12, 13, 14, 15, 19, 30, 37, 41, 46, 54, 55, 57, 59, 62, 64, 65, 66, 67, 68, 69, 71, 72, 73, 78, 84, 85, 87, 89, 96, 106, 118, 144, 150, 158, 161, 195, 207, 208, 210, 211, 212.
- Broiler, 1, 4, 5, 8, 9, 10, 11, 12, 13, 14, 18, 19, 23, 45, 46, 47, 48, 49, 50, 53, 54, 55, 58, 59, 60, 61, 62, 64, 67, 68, 70, 71, 72, 73, 79, 80, 83, 84, 86, 87, 91, 94, 96, 97, 98, 99, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 116, 117, 118, 119, 120, 150, 152, 160, 142, 144, 145, 167, 189, 209, 210, 212, 213, 214, 217, 218, 221, 224, 226, 247, 250, 254, 255, 259, 260, 261, 262, 263, 264.
- Broiler Breeder, 1, 4, 10, 13, 18, 19, 23, 45, 46, 47, 48, 49, 50, 53, 55, 58, 59, 60, 61, 62, 64, 67, 68, 70, 71, 72, 79, 80, 83, 84, 86, 91, 94, 96, 97, 98, 99, 103, 104, 105, 106, 126, 131, 143, 144, 147, 149, 212, 214, 216, 217, 218, 221, 222, 225, 229, 230, 231, 252, 254, 263, 264.
- Broiler Production, 122, 247, 255, 260, 261, 263, 264.
- Broiler-Breeder Paradox, 54, 55.
- Brooder Management, 25.

### C

- Calcium Metabolism, 21.
- Chick Immunity, 249, 260.
- Chick Production, 45, 47, 53, 93, 94, 214, 226.
- Chick Quality, 79, 247, 250.
- Chicken, 5, 6, 7, 13, 30, 31, 32, 38, 39, 40, 41, 42, 43, 44, 45, 47, 78, 94, 95, 96, 97, 100, 101, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 116, 117, 118, 119, 120, 150, 152, 160,

165, 166, 178, 186, 204,  
208, 209, 212, 228, 230,  
245, 246, 261.

Chicken Farming, 38.

Clinical Presentation, 241.

Coccidiosis, 177, 179, 183, 188,  
189, 190, 192.

Codaf, 129.

Cumulative Nutrition, 60, 61, 63,  
68.

## D

Daily Feeding, 9.

Debeaking, 41.

Diagnosis, 185, 193, 242.

Dietary Selenium, 217, 218, 219,  
220, 221, 223, 224, 226.

Diets, 6, 19, 20, 21, 22, 23, 24,  
25, 50, 59, 62, 64, 65, 66,  
67, 75, 76, 99, 214, 216,  
217, 218, 219, 224, 226,  
249, 259, 260, 261.

Drinking Systems, 121, 134.

## E

Egg Drop Syndrome, 183.

Energy Expenditure, 52, 76, 97.

Enzyme Supplementation, 75.

Erysipelas, 115, 183, 189.

Euro Agro Products, 130, 131.

## F

Farming, 29, 30, 33, 39, 44, 45,  
96, 106, 110, 113, 119.

Fatty Liver, 115, 154, 188, 189,  
190, 191.

Feed Factory Technology, 250, 252.

Feed Reduction, 58, 63.

Feeding Programmes, 3, 23, 71,  
79, 80, 144.

Feeding Systems, 121, 127, 128,  
134, 136.

Fertility, 12, 19, 27, 48, 50, 55,  
57, 61, 62, 63, 64, 65, 67,

68, 69, 70, 71, 72, 81, 91,  
95, 97, 119, 142, 143, 209,  
210, 214, 217, 218, 220,  
221, 224, 226, 242, 243,  
248.

Follicular Development, 97, 242.

Follicular Dynamics, 46.

Follicular Waves, 242.

Fowl Cholera, 183, 186, 188, 189.

Fowl Pox, 115, 183, 186.

Fumigation, 204, 205, 206.

## H

Hatchery Design, 206.

Hatching, 2, 4, 6, 46, 47, 54, 94,  
111, 112, 113, 114, 139,  
142, 174, 182, 194, 195,  
196, 197, 198, 199, 200,  
201, 202, 203, 204, 205,  
206, 207, 215, 220, 247,  
262, 263.

Hatching Eggs, 2, 4, 54, 94, 195,  
196, 203, 205, 206, 207.

Hen, 1, 3, 16, 33, 35, 36, 37,  
41, 46, 48, 49, 50, 51, 52,  
56, 61, 63, 64, 79, 91, 96,  
103, 105, 107, 110, 111,  
112, 116, 117, 118, 119,  
139, 140, 142, 151, 155,  
161, 166, 168, 175, 194,  
199, 208, 209, 210, 213,  
214, 217, 218, 220, 222,  
223, 224, 226, 228, 229,  
232, 233, 234, 236, 245,  
247, 249, 250.

Hormone Analyses, 101.

Human Protection, 257.

Hygienic Feed Preparation, 76.

Hygienic Status, 73, 74, 75, 78.

## I

Incubator Room, 195, 196, 200,  
201, 205, 207.

Infectious Bronchitis, 115, 182.

Infectious Bursal Disease, 115, 182.

## L

Leptin Receptor, 96, 99, 101, 102.

Leptin Receptor, 97, 98, 100, 101,  
102, 103, 104, 105, 106,  
149.

Liver Disease, 188.

Lymphoid Leukosis, 188, 189, 190.

## M

Minerals, 51, 165, 167, 168, 170,  
171, 172, 173, 174, 194,  
208, 216, 248, 249, 256.

Mycoplasma, 183, 188, 191, 193.

## N

Necrotic Enteritis, 13, 179, 183,  
184, 251.

Newcastle Disease, 115, 155, 179,  
186.

Nipple Drinkers, 173, 179.

Nipple Drinkers, 25, 121, 130,  
131, 173.

Nutrition, 20, 21, 24, 30, 53, 60,  
61, 62, 63, 68, 73, 95, 97,  
161, 164, 194, 234, 235,  
255, 256.

## O

Overfeeding, 15, 48, 50, 57, 80,  
81, 83, 150, 154, 214.

Ovulatory Phase, 238, 239, 240,  
243.

## P

Photostimulation, 1, 23, 47, 63,  
65, 66, 76, 77, 78, 80, 82,  
84, 85, 88, 89, 90, 91, 98,  
106, 107, 108, 109, 110,  
115, 116, 170, 172, 173,  
174, 175, 176, 246, 251.

Plasma Lipid, 101, 103.

plasma lipid, 101, 145.

Poultry, 5, 6, 14, 29, 30, 31, 32,  
34, 35, 36, 37, 39, 40, 41,  
42, 43, 44, 45, 48, 53, 55,  
70, 74, 78, 95, 106, 110,  
113, 114, 120, 127, 128,  
129, 130, 131, 134, 136,  
150, 154, 155, 157, 158,  
159, 164, 166, 169, 170,  
171, 172, 173, 174, 178,  
180, 181, 192, 196, 204,  
211, 212, 217, 220, 245,  
246, 256, 264.

Poultry Disease, 185.

Poultry Farming, 29, 39, 106, 110,  
113.

Poultry Feeds, 163.

Prevention, 78, 178, 179, 181,  
183.

Protein, 6, 20, 24, 44, 49, 51,  
52, 53, 59, 62, 64, 66, 67,  
68, 73, 79, 95, 97, 114,  
145, 148, 152, 153, 165,  
167, 168, 169, 170, 171,  
172, 174, 217, 235, 237,  
248.

Psittacosis, 116.

Pulmonary Hypertension, 188.

## R

Rearing, 8, 23, 34, 55, 56, 57,  
60, 61, 62, 63, 64, 65, 71,  
79, 85, 86, 87, 89, 98, 126,  
132, 135, 137, 140, 141,  
143, 144.

Reproduction, 1, 3, 10, 46, 47,  
50, 53, 55, 56, 60, 61, 65,  
68, 79, 83, 213, 220, 245,  
246.

Reproductive System, 1, 46, 50,  
213, 226, 228, 229, 230,  
238.

RNA Extraction, 99.

Roxell, 131, 134.

**S**

Sex Maturity, 232.

Sexual Maturation, 1, 4, 47, 50,  
79, 80, 81, 82, 83, 89, 91,  
94, 214.

Swollen Head Syndrome, 12.

**T**

Trace minerals, 51, 165, 167, 249.

Treatment, 41, 48, 60, 65, 70,  
73, 74, 75, 76, 77, 78, 81,  
83, 92, 93, 99, 184, 205,  
219, 220, 221, 222, 223,  
224, 225, 226, 260, 262,  
263, 264.**V**Ventilation, 114, 142, 157, 158,  
160, 177, 178, 179, 185,  
195, 196, 197, 201, 207,  
258.Vitamin, 30, 41, 51, 165, 168,  
171, 186, 187, 191, 192,  
193, 214, 215, 216, 217,  
249, 250, 260, 261, 263.**W**

Week Feeding, 9.

**Y**

Yield-Type Broiler Breeders, 62.

Yolk formation, 144, 145, 150, 151.

□□□