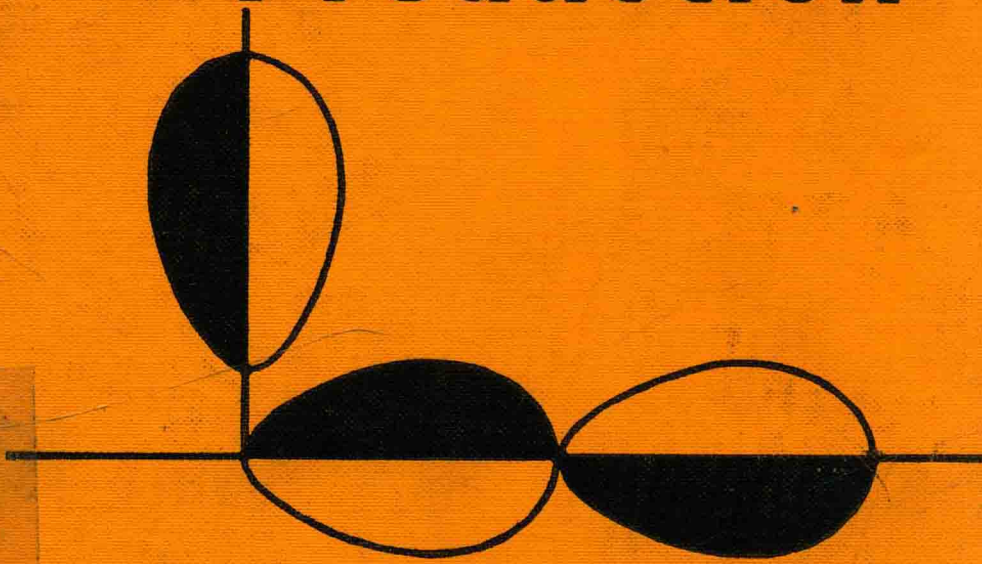
Poultry Production



BY LESLIE E. CARD, Ph. D

Poultry Production

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Leslie E. Card, Ph.D.

Professor of Animal Science, University of Illinois, Urbana, Illinois

Ninth Edition, Thoroughly Revised,

With 198 Illustrations and 4 Plates, 2 in Color

LEA & FEBIGER

PHILADELPHIA

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Preface to the Ninth Edition

EACH succeeding edition of Poultry Production has seen increasing emphasis placed on the results of research, and on the interpretation of new findings as they apply to poultry practice. This approach is especially important for an industry which has been influenced by so many technological developments in recent years as has the poultry industry. But this is not a "how-to-do-it" book. It stresses the fundamental principles underlying successful poultry practice, and shows why a knowledge of them is essential to a full understanding of the subject.

As in the eighth edition, there are no lists of references such as had been included previously. The decision to omit them was made with some reluctance as one means of keeping the price of the book at a reasonable figure.

My colleagues at the University of Illinois have offered many suggestions and pertinent criticisms. Dr. H. M. Scott and Dr. D. J. Bray, who have used the book in their classes, have been particularly helpful.

Dr. Bradley M. Patten and The Blakiston Company very kindly permitted the use of four illustrations from the fourth edition of "Early Embryology of the Chick," and The Company of Biologists, Ltd., Cambridge, England, granted permission to reproduce from the *Journal of Experimental Biology* the illustrations used in Plate II.

Several illustrations were made available through the courtesy of the publishers of *Poultry Tribune, U. S. Egg and Poultry Magazine, Broiler Business, Poultry Processing and Marketing, Pacific Poultryman*, and *American Poultry Journal*. Credit has been indicated in all such cases.

The organization of the book has not been changed except for omission of the chapter formerly entitled "Management Practices," and separation of the material on marketing into a chapter on Marketing Eggs and one on Marketing Poultry.

L. E. C.

URBANA, ILLINOIS
January, 1961

A Personal Note to Students

Textbooks are traditionally descriptive, factual and conservative, and they too often make dry reading. The author is expected to write as if talking *about* his subject rather than *to* his readers. This results in a formal style which does not help the "meeting of minds" between author and reader.

I have gone along with precedent in the fourteen chapters which follow, but because I believe that you who study this book are entitled to something more than this, and because many of you are presumably advanced undergraduates in Land-Grant Colleges of Agriculture, I want to tell you why I have stressed certain subjects and have treated others very briefly. I also want to give you some idea of the opportunities which may be open to you when you graduate.

During twenty-five years of teaching undergraduate students at the University of Illinois I have observed that certain subject matter topics, year after year, were difficult for students to grasp. Some of these topics I have tried to clarify in this revision by a new, or at least a different, approach. Others have been expanded to include more background material.

Those of you who have elected a course in poultry husbandry—yes, even those who are taking poultry as a required course—are fortunate in that this, like most subjects in agriculture, deals with living things. The pertinent information is constantly changing—it is not static. That is why textbooks must frequently be revised or rewritten.

Up to the turn of the century most poultry books dealt with breeds and varieties and with the art of feeding and management. There was no science of poultry production, nor was there a poultry industry as we know it today. Mammoth incubators and the coal stove brooder had not been invented. There was no information about the inheritance of egg production. Almost nothing was known about vitamin requirements of chickens, or about the efficiency with

which chickens could transform feed into poultry meat. No one was studying the cost of egg production, and there were no egg and poultry processing plants.

All this has changed. We now know far more about the genetics of the fowl and about the nutritional requirements of the growing chick than is known about any other animal species of economic importance. Conversely, breed and variety have become of minor importance except as they affect economic production and returns. Very few poultrymen today are concerned about the number of points on a single comb, about a few black feathers on a Barred Plymouth Rock, about whether a White Plymouth Rock is "pure bred," or about a little down between the toes of baby chicks. But they are very much concerned about how fast the feathers grow, how well they cover the chicken, whether gains are rapid and economical, and whether the production index of a flock is 200 or more eggs.

This ninth edition of Poultry Production differs from most other texts in the field in several ways:

1. It minimizes the discussion of breeds and varieties.
2. Endocrine secretions and the stimulus of light are presented as fundamental factors influencing the performance of both growing chicks and laying hens.
3. Poultry breeding and improvement are discussed in terms of the interaction of heredity and environment and the relation of this concept to selection methods.
4. Poultry housing is considered from the point of view of both biology and engineering as they relate to climatic control and management efficiency.
5. The significance of individual amino acids and of the fundamental nature of energy requirements in poultry feeding is dealt with in considerable detail.
6. The continuing trends toward increased specialization, larger production units, and integration of the industry, are recognized as being inherent in the economic development of this important branch of agricultural production and marketing.

If this seems confusing and a bit difficult, it is only because poultry science has been making rapid advancement. You are to be congratulated on having the opportunity to participate in that advancement. And as you become familiar with the vast literature bearing on the whole subject of poultry and egg production, you will realize that neither interpreting nor condensing this material into a book to be covered in a single quarter or semester has been an easy task. I have tried to do both of these things in such a way as not to mislead any reader. How well I have succeeded, only you and your instructor can judge.

Opportunities for College Graduates.—Opportunities in the poultry business are closely related to the food needs of the population.

Psychologists often refer to human wants and desires, but food is a need that is important to most people three times a day. The simple fact that births in the United States are occurring at the rate of one about every ten seconds furnishes ample evidence of the continuing opportunity which exists in all branches of the food industry. The poultry business benefits because poultry and eggs are important items of human food.

Because of increased efficiency in agricultural production, and because of the increasing demand for many new kinds of goods and services, the long-time trend in population shifts has been away from farms into cities and towns. As long as this continues, it means that numerically there will be more opportunities for employment in the cities and towns than on farms, and many agricultural college graduates must look in that direction because there are not enough places for them on farms.

Many employers in both large and small businesses related to agriculture prefer to hire college-trained men who have a farm background. The reasons are simple. A college graduate is favored because he had the energy and vision to spend four years in study and preparation for a job. A farm background usually means that he is willing to work and that he knows how; that he is resourceful, and can improvise when necessary, to meet a new situation. It means also, especially if it included 4-H or F. F. A. experience, a character background which makes for good citizenship—a most valuable asset in any business. Of course along with these qualities, the college graduate is expected to know something about poultry management, poultry nutrition, poultry genetics, or poultry and egg marketing, as the case may be.

Some of the best job opportunities are in sales and service with feed manufacturers, poultry equipment and supply firms, hatcheries, and specialty companies manufacturing or dealing in products which are needed by various branches of the poultry industry. There are numerous opportunities in the processing field because of the tremendous volume of poultry and eggs handled every year. In choosing a job in any one of these fields, it is well to find out about the local reputation of the particular business firm or local branch. Is the local manager thought well of in the community? Are the present employees enthusiastic about their work?

There are also a great many jobs which call for some knowledge of poultry as part of a broad agricultural training. Assistant county agents, teachers of vocational agriculture, and service men with farm supply companies are examples.

Becoming a Poultryman.—The poultry business is safer and saner today than it was twenty years ago. There are fewer complications, because of more and better knowledge about feeding, breeding and management. As evidence of this, large production units are be-

coming the rule rather than the exception in most sections of the country.

If you want to get into the poultry business for yourself, there are several possibilities. You can follow the sound and time-honored procedure of going to work for someone else while gaining experience and accumulating sufficient capital to start your own business. In some of the commercial broiler areas you can, with even limited experience, get started on a basis in which the financial risk is largely assumed by a feed dealer, hatcheryman or processor who advances the money for chicks, feed, and perhaps for equipment. The operator supplies all labor in exchange for a share in the returns.

Acquiring a hatchery with limited capital is more difficult. There are fewer opportunities for new hatcheries today than there were twenty years ago, and a prospective owner may have to purchase an entire plant and good will. You might, however, be so fortunate as to find an owner who is about ready to retire and who would take you in as a partner, giving you the opportunity of buying the business as you can.

You might make similar arrangements for the purchase of a commercial egg farm. Or you might have a chance to take over the managership of such a farm on a salary and profit-sharing basis, with the understanding that an opportunity to purchase would be given later. Whatever the arrangement, you as the new operator must remember that it takes time, energy and money to establish a successful business. You must therefore be willing to put in several years of your own time and energy if you are to develop a new business or acquire one that is already established.

Whatever your future objective—whether it is to become identified with the four-billion-dollar poultry industry or simply to be a better-informed consumer of its products—I trust that your study of this book may be both interesting and profitable. If you gain nothing else, you should have a better conception of the magnitude and significance of the poultry industry and an understanding of why so many men are proud to be a part of it.

L. E. Card

Poultry Production

Chapter 1

The Poultry Industry

THE business of producing poultry and eggs, like many other phases of commercial farm production, is concentrating in fewer hands. This is not a new development but it has been accelerated in recent years by increasing and prolonged cost-price pressures which in turn have provided the incentive for many technological developments in the industry. Census reports provide a clear indication of the long-time trend, as shown by the following brief tabulation.

	Percentage of all farms reporting chickens sold	*Average number sold per farm*	*Percentage of all farms reporting eggs sold*	*Dozens sold per farm*
1929	50	91	62	505
1939	41	119	*	*
1949	32	343	45	995
1954	22	940	35	1,576
1959†	21	1,950	29	3,040

*Not reported
†Estimated from incomplete data

There has been geographical concentration also. Over half of the poultry farms reported in 1954 were found in ten States (See Table 1). Furthermore, 22 per cent of the commercial broilers sold in 1954, and 11 per cent of all chicken eggs sold, came from the ten leading counties. This trend has continued. According to estimates made by the U. S. Department of Agriculture, over half of the commercial broilers produced in 1959 were raised in the five States of Georgia, Arkansas, Alabama, North Carolina and Texas.

Poultry production exists as an industry because poultry and eggs are prized as human food. Chickens are often raised as a hobby, feathers are put to many different uses, and great quantities of eggs are used in the preparation of therapeutic vaccines, but all these things are distinctly secondary to the use of poultry and eggs as human food. Furthermore, the business of producing, processing,

transporting, storing, financing, and serving food gives employment to more persons in this country than do all other businesses combined. Poultry meat and eggs are important commodities in the food business.

TABLE 1.—THE TEN LEADING STATES IN NUMBER OF POULTRY FARMS* AND IN TOTAL VALUE OF POULTRY PRODUCTS SOLD, 1954. (FROM THE U.S. CENSUS OF AGRICULTURE, 1954).

Rank	*State*	*Number of poultry farms*	*Rank*	*State*	*Poultry products sold (millions)*
1	Pennsylvania	11,851	1	California	$188
2	California	11,574	2	Pennsylvania	115
3	Georgia	10,742	3	Minnesota	103
4	Texas	8,940	4	Iowa	96
5	New York	6,963	5	Georgia	95
6	North Carolina	6,718	6	Texas	80
7	New Jersey	6,679	7	New Jersey	80
8	Indiana	5,937	8	New York	78
9	Ohio	5,877	9	Indiana	70
10	Arkansas	5,267	10	Ohio	70
Ten-State Total		80,548	Ten-State Total		975
United States		154,257	United States		$1,919

*A poultry farm, as defined by the Census, is one on which 50 per cent or more of total sales was realized from poultry products.

TABLE 2.—THE TEN LEADING STATES IN GROSS POULTRY INCOME FROM CHICKENS, EGGS, AND COMMERCIAL BROILERS, 1959. BASED ON ESTIMATES BY THE U.S. DEPARTMENT OF AGRICULTURE.

Rank	*State*	*Millions of Dollars*			
		Chickens	*Eggs*	*Broilers*	*Total*
1	Georgia	7.9	54.5	153.0	215.4
2	California	9.7	137.3	32.0	179.0
3	Pennsylvania	11.6	109.0	28.1	148.7
4	North Carolina	8.3	61.9	68.9	139.1
5	Texas	5.1	61.3	55.4	121.8
6	Iowa	8.0	97.8	2.5	108.3
7	New Jersey	4.5	72.7	6.9	84.1
8	Indiana	6.1	56.0	21.5	83.6
9	Minnesota	5.4	72.6	3.0	81.0
10	Ohio	5.9	59.5	9.0	74.4
United States		155.4	1,617.7	922.4	2,695.5

Changes in population can have significant effects on the poultry business. In 1930 California shipped more eggs to New York, Chicago and Philadelphia than it did to either of its own markets, San Francisco and Los Angeles. Since 1950 it has shipped almost no eggs east, and its own poultry industry has greatly expanded in

order to meet the needs of its rapidly growing population. In 1959 California surpassed Iowa to become the leading state in total number of eggs produced.

TABLE 3.—THE RANK OF THE FIRST TEN STATES IN PERCENTAGE OF TOTAL FARM CASH RECEIPTS DERIVED FROM POULTRY AND EGGS, 1959, WITH COMPARISONS FOR EARLIER YEARS. (DATA FROM U.S. DEPARTMENT OF AGRICULTURE.)

Rank	*State*	*1959*	*1949*	*1939*	*1929*
1	Delaware	55	71	57	33
2	New Hampshire	41	47	33	27
3	Maine	39	26	14	12
4	New Jersey	29	39	23	23
5	Connecticut	29	31	23	18
6	Georgia	28	13	5	5
7	Massachusetts	26	36	24	19
8	Maryland	26	30	18	18
9	West Virginia	25	31	18	20
10	Rhode Island	22	27	19	19
United States		9	11	10	10

TABLE 4.—THE TEN LEADING COUNTIES IN CHICKENS AND EGGS SOLD IN 1954, WITH COMPARISONS FOR 1949. (FROM U.S. CENSUS REPORTS.)

Chickens Sold			*Eggs Sold*		
County	*Rank*		*County*	*Rank*	
	1954	*1949*		*1954*	*1949*
Sussex, Del.	1	1	Los Angeles, Calif.	1	2
Washington, Ark.	2	4	Monmouth, N. J.	2	3
Benton, Ark.	3	3	San Bernardino, Calif.	3	6
Wicomico, Md.	4	7	Sonoma, Calif.	4	1
Scott, Miss.	5	49	Ocean, N. J.	5	4
Hall, Ga.	6	12	Lancaster, Pa.	6	5
Cherokee, Ga.	7	5	Cumberland, N. J.	7	8
Worcester, Md.	8	2	San Diego, Calif.	8	11
Rockingham, Va.	9	9	Orange, Calif.	9	26
Forsyth, Ga.	10	13	Atlantic, N. J.	10	15

GROWTH OF THE INDUSTRY

The poultry industry has shown a tremendous growth in the last twenty-five years, largely because of a complete and fundamental change in viewpoint. Instead of keeping chickens as a hobby or a sideline, for pleasure and some incidental profit, thousands of flock owners have come to look upon the poultry enterprise on their farms as an economic unit, a means of livelihood, a source of income by which to raise and educate a family and acquire a certain degree

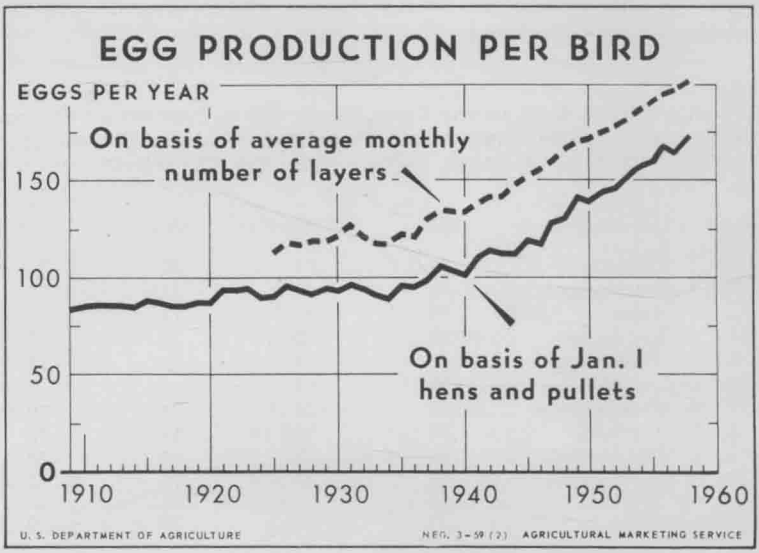

FIG. 1.—Annual rate of lay has been increasing steadily for about 20 years.

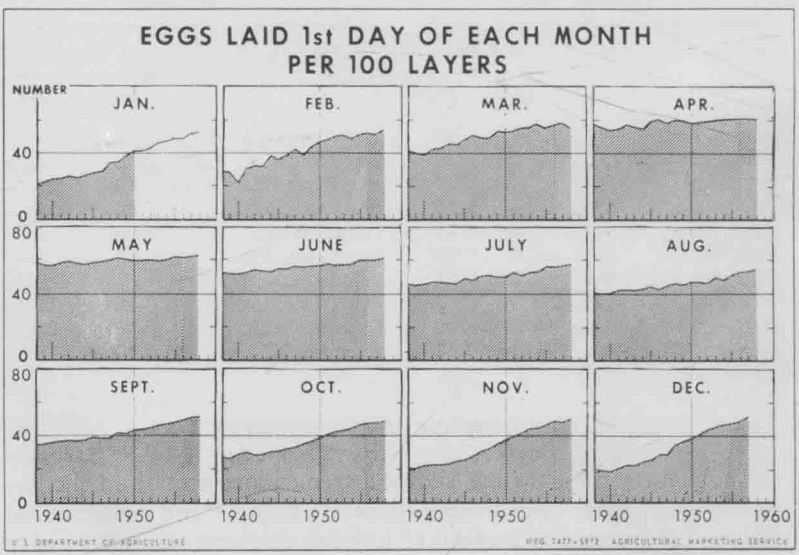

FIG. 2.—The increase in rate of lay since 1940 has been most marked in the months of October, November, December and January.

of economic independence. Instead of keeping chickens, they have made the chickens keep them.

In January, 1925, the U. S. Department of Agriculture began reporting the number of eggs produced each month for each 100 layers on farms. For twelve years the annual total ranged a little above or below 120 eggs for each hen and pullet in farm flocks. Then in 1937 there began a steady and almost continuous rise in production which brought the 1959 figure to 206, 70 per cent above the average for the first twelve years of record.

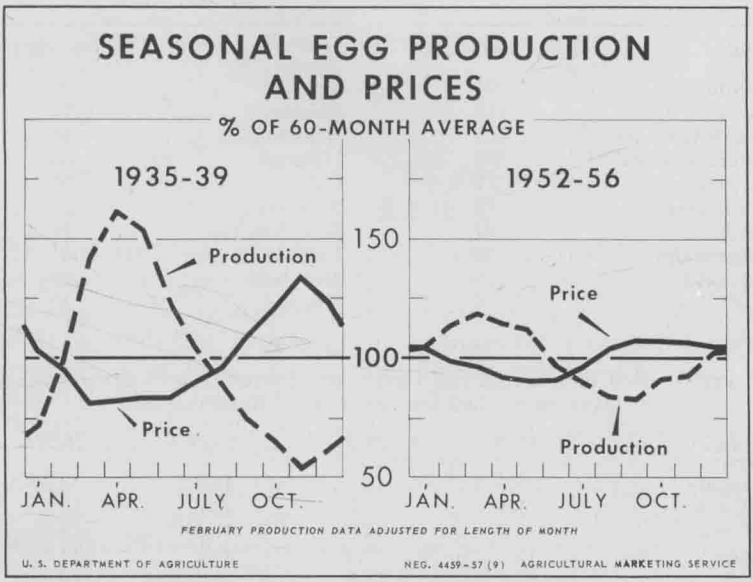

FIG. 3.—Seasonal variation in both egg production and prices has been much less in recent years than formerly.

There are several reasons for this spectacular rise, and the increased production has, in turn, been responsible for many other marked changes in the poultry industry. In 1928, about 43 per cent of the chickens raised on farms were hatched under hens, and only 23 per cent were bought as baby chicks. By 1938, 66 per cent of the chickens raised were purchased as baby chicks. In 1959, this figure had risen to 96 per cent and, in addition, commercial hatcheries produced over 1,800 million chicks for the commercial broiler trade. This change has enabled producers to start their chicks earlier than is usually possible when all must be hatched on the farm where they are grown. The pullets raised from these early chicks are ready to lay in September or October instead of in November or December.

Early hatching by commercial operators meant that breeding