MANAGEMENT PRACTICES AND PROBLEMS OF COMMERCIAL EGG PRODUCTION ON OKLAHOMA FARMS

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CHAPTER I

INTRODUCTION

Poultry science separates production activities into three phases--breeding, feeding, and management. Improvements in either one of these three phases are important to Oklahoma commercial poultry producers if they are to compete successfully with other states in a competitive egg market. These three phases of production are important in determining the rate of production which in turn is an important factor in determining labor-management returns for the poultry enterprise.

The average rate-of-lay in Oklahoma, although it has increase from 112 eggs per hen in 1930 to 177 eggs per hen in 1957, has been about 10-20 eggs per hen below the national average each year since 1930 (Appendix A-B). Oklahoma, with an average rate-of-lay of 179 eggs per layer in 1958, ranked 43rd in the states.[1] This indicates that Oklahoma poultry producers have not adopted technological improvements to the same extent that producers have in other areas or that they are not securing the same results from the improvements in the three phases of production.

Commercial hatcheries provide over 95 per cent of replacement chicks required by Oklahoma commercial poultry producers each year. Therefore, improvements in breeds and strains of chickens have become primarily a function of hatcheries and specialized poultry breeding farms supplying

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[1] The Poultry and Egg Situation, May, 1959, Agricultural Marketing Service, U. S. Department of Agriculture, PES-201, 1959, p. 33.

eggs to hatcheries. Breeding is also conducted by land-grant colleges, as well as commercial hatcheries. The individual poultry producer relies on other agencies for continued improvement in poultry breeds and strains, and it is assumed that the level of improvement in breeding available to producers in Oklahoma is equivalent to other areas. Therefore, commercial poultry producers in Oklahoma have access to identical resource qualities available to producers in other areas.

Nutritional research conducted by land-grant colleges and commercial feed companies has resulted in improved feed efficiency. A large portion of commercial poultry producers are buying mixed commercial feeds, improved in quality and calorie-protein balance, fortified with vitamins, minerals, and other ingredients that have contributed materially to the improvement in egg production during recent years.[2]

There are indications that a large portion of the research in poultry science has been directed toward improvements in breeding and nutrition. Although this research has been very useful to the poultry producer, it is the general opinion of most poultrymen and research personnel, that management practices may be the limiting factor in egg production in Oklahoma. This stems from the fact that production at the farm level in Oklahoma is not comparable with production at the farm level in other states and is considerably below the level obtained by research.[3]

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[2]L. C. Norris, "Significant Advances of the Past Fifty Years in Poultry Nutrition," Poultry Science, Vol. 37, March, 1958, pp. 256-274.

[3]Byron T. Shaw, The Role of Research in Meeting Future Agricultural Requirements, (Presented at the Forty-fourth Annual Meeting of the American Society of Agronomy, Cincinnati, Ohio, November 18, 1952), pp. 6-11.

Several management factors affect production in addition to nutrition and breeding, which may partially explain the difference between egg production on any two farms or between states. These are: the amount of floor, ventilation, feeder and water space, the length of daylight maintained, the culling and replacement practices, the number and location of nests, sanitation, disease and parasite control, and feeding practices that are independent of feed qualities.

To obtain maximum results from technological advances in any phase of production requires improvements in the remaining phases. Therefore, to accomplish the goal of management, that is, to obtain maximum production at minimum average cost, improvements in poultry management at the farm level are imperative.

Problem Situation

The commercial poultry producers have inadequate information on capital requirements, both fixed and operating, flock replacement costs and alternatives, labor requirements, and other management practices to use as guides for allocating resources to the poultry enterprise or for comparison with other enterprises. These data are essential if the objective of poultry producers, to maximize returns to resources, is secured.

Objectives

The general purpose of the study was to obtain information related to investments, flock replacement cost and alternatives, labor requirements, and to discover management practices associated with efficient

poultry enterprises. This study was designed specifically to: (1) investigate the characteristics of commercial poultry flocks in Oklahoma or farms that had flocks with four hundred or more laying chickens, (2) describe and evaluate the various management practices followed, and (3) to analyze alternative flock replacement methods.

Characteristics of the Poultry Industry in Oklahoma

The poultry enterprise is an important segment of the agricultural economy of Oklahoma. In 1957 the value of poultry and egg production was $29,760,000. It ranked sixth among the principle crop and livestock enterprises of the state.[4] During the ten year period of 1948-57, the average annual egg production in Oklahoma was 1,006,000,000 eggs, valued at $29,946,000.[5]

Although the average rate-of-lay has increased on Oklahoma farms in recent years, the average number of hens, total eggs produced, and gross income from poultry egg production has decreased, since reaching a peak in numbers of 11,540,000 hens and 1,642,000,000 eggs produced in 1944.[6] In terms of total eggs produced, Oklahoma ranked twenth-second among the states in 1957. In the ten year period 1948-57, egg production in Oklahoma accounted for 1.72 per cent of the total eggs produced in the United States.

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[4] Annual Report of the Oklahoma State Board of Agriculture, 1957-58, State Board of Agriculture and the Agricultural Marketing Service, U. S. Department of Agriculture, p. 65.

[5] Ibid., p. 65.

[6] Appendix Table C.

The Agricultural Census of 1954 reported that 91,764 farms in Oklahoma had a total of 5,879,480 layers that were four months or older.[7] This represented an average of 64.1 layers per farm, or a decrease of 21.34 percentage points in number since 1950.[8] The number of eggs produced decreased 30.69 percentage points in Oklahoma from 1949 to 1954. This was concurrent with decreasing number of farms with poultry, increasing size of poultry flocks, and an increasing rate-of-lay.

The number of farms reporting poultry decreased 24.29 percentage points from 1950 to 1954. Although the number of farms reporting poultry decreased sharply, there has not been a proportionate decrease in numbers of layers due to an increase in the size of poultry flocks.

Time and Area of Study

The study was based on data obtained from personal interviews with commercial poultry operators during the period, September 1, 1958 to July 15, 1959. Sixty-one commercial poultry producers were selected from twenty-five counties. These counties comprise a northeast-southwest diagonal and a northwest-southeast diagonal across the state (Figure 1). The specific counties selected from the northeast-southwest diagonal were: Ottawa, Craig, Rogers, Tulsa, Creek, Lincoln, Oklahoma, Caddo, Kiowa, Greer, and Harmon. The counties selected from the northwest-southeast diagonal were: Texas, Beaver, Woodward, Dewey, Blaine, Canadian, Cleveland, Pottawatomie, Pontotoc, Atoka, Coal, Pushmataha, Choctaw, and McCurtain.

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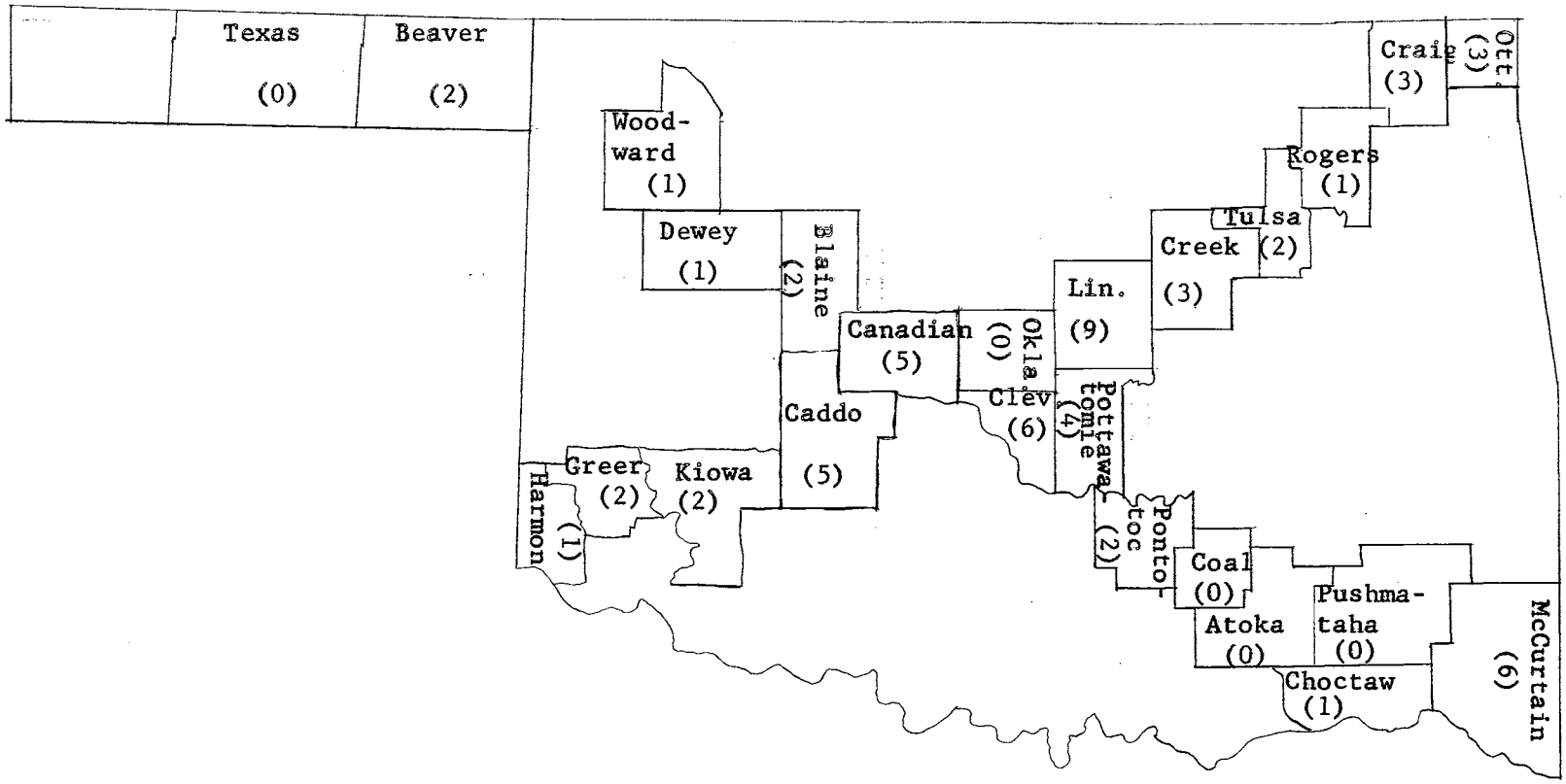
[7] Appendix Table E.

[8] Ibid.



Note: The figure in each county denotes the number of producers interviewed.

Figure 1: Counties Selected and Number of Producers Interviewed in Each County, 1959

Five of the counties located on the diagonals were not included. Oklahoma County was omitted from the study to prevent the small sample from concentrating on producers from the middle portion of the state. The four counties--Atoka, Texas, Coal, and Pushmataha--were not used because there were few, if any, commercial flocks located in these counties, except Texas, according to the information available. The producers selected in Texas County were excluded from the sample after two attempts to contact these producers failed.

Limiting the sample area to counties located on the two diagonals across the state accomplished two primary objectives: (1) to account for variations in climatic conditions that might affect management practices, and (2) it facilitated a study of the influence in type and costs of housing in different sections of the state. Secondary objectives were: (1) more information was needed about farms with commercial poultry enterprises, such as kind and size of other enterprises in all areas of the state, and (2) to discover specific management problems peculiar to certain areas of Oklahoma.

Selection of the Sample

County Agents, Vocational Agricultural teachers, hatcherymen and feed dealers were contacted in each county to obtain a complete numeration of commercial poultry producers with more than 400 laying birds. Representative producers were selected according to number and size of flocks from each county by these agencies and business establishments. A producer was included in the sample after appearing on two or more individual lists. The sample was concentrated in Lincoln, Canadian, Caddo, Cleveland, and Pottawatomie counties.

Classification of the Sample

Two distinctly different methods of production were practiced by commercial egg producers. These were: (1) cage, and (2) floor plan operations. The cage production method confined the birds to individual cages. The cages varied in size from 8 to 12 inches in width, about 15 inches high and 16 to 18 inches in length. The most common size was 10" x 15" x 18".[9] The hen spends her entire adult life in the enclosure, suspended approximately 30 inches from the floor when single decked. Feed troughs were located at the front of the cage, and water was provided in a trough at the back of the cage. One water trough served two rows of cages. The floor of the cage was 1" x 2" welded wire fabric and slanted so that the eggs rolled out in front as soon as they were laid. The floor plan method of egg production differed from the cage method in that the birds were not confined to any given area of the building. The colony-cage was an adaption of the communal floor plan and the cage plan of operation. These methods of production were considered separately in the study since each method of production required different management practices. Also, different housing and equipment costs were involved.

There are several advantages and disadvantages that are usually associated with each method of production and are generally recognized as being peculiar to that method of production.[10] The advantages associated with the cage method are: (1) easier and more accurate culling,

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[9]Alex Warren and Sewell Skelton, Cage Layers in Oklahoma, Oklahoma Extension Circular 656, p. 3.

[10]Donald C. Paris, Economic Comparison of the Cage and Floor Methods of Egg Production, Kentucky Agricultural Experiment Bulletin 652, June, 1957, pp. 12-13, and James E. Hill, Robert C. Albritton, and Lester J. Dreesen, Cage Versus Floor Operations for the Production of Commercial Eggs, Mississippi Experiment Station, Bulletin 551, (May, 1957), p. 17.

(2) eggs cool quicker, (3) production can be maintained at near full capacity the year round, (4) the possibility of a more even distribution of labor and operating capital requirement is afforded, (5) cull hens are in better condition and sell at a higher price (6) mortality is reduced by timely culling, (7) prevents cannibalism, (8) possibility of a price premium on eggs, (9) number of broody hens is decreased, (10) less trouble from soil-borne diseases is experienced, (11) the number of layers maintained at the capacity level, and (12) replacements are made in small segments (also may be cited as a disadvantage).

Disadvantages of the cage method are: (1) not as flexible as the floor method, (2) different ages of birds are maintained on the farm, (3) watery droppings occur, particularly in summer months, (4) flies are a problem, (5) birds may be culled too soon, (6) "wire marked" eggs may be discounted, and (7) relatively high investment per hen in equipment.

Advantages of the floor method are: (1) less investment in equipment per hen, (2) a larger percentage of production occurs during the seasonal high egg prices, (3) a larger flock can be started for the same equipment investment, (4) more flexibility, (5) less total labor for the same size flock,[11] and (6) less fly problem.

Disadvantages of the floor method are: (1) cannot cull as accurately, (2) the distribution of capital and labor requirements is indeterminate, (3) generally lower production per hen with usual management practices, (4) mortality is higher, (5) output declines as flock size decreases throughout the year, (6) cannibalism occurs, if birds are not

[11] Donald G. Paris, op. cit., p. 7. However this study did not verify this advantage of floor flocks.

properly managed,[12] (7) more difficult to maintain a given level of output, (8) birds susceptible to soil-borne diseases and parasites, and (9) the entire flock replaced at one time (also may be cited as an advantage).

The importance of the advantages and disadvantages depends upon the variation of managerial ability, available capital, kind and amount of farm family labor, and market preferences for each enterprise. The relative profitableness of either method depends upon the level of production which managers get from each method of production.

The floor plan flocks were further classifed according to the type of eggs marketed. These two types were: (1) eggs produced for the quality egg market, and (2) eggs produced for hatcheries. The major differences between these two sub-classes were the labor requirement in handling eggs and type of egg storage facilities required.

In order to determine variations in capital investment and management practices, it was necessary to stratify the commercial poultry flocks according to number of birds housed.[13] The first stratum contained all flocks with 400 to 799 birds housed. The second stratum contained flocks with 800 to 1599 birds and the third stratum contained all remaining flocks with more than 1600 birds housed on September 1, 1958.

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[12] It could be argued that cannibalism is a manifestation of a physiological deficiency in the layers and provides management with the necessary information for action. This information would not be available to the cage producer to enable him to correct the deficiency.

[13] For the purpose of this study, commercial poultry flocks were defined as farm flocks with 400 or more birds. The size grouping corresponds to the Agricultural Census classification.

Related Characteristics of the Sample Survey

The schedule was designed to secure information concerning general characteristics of farms having commercial flocks. These characteristics were size and type of farm, investments in land, machinery and buildings, the nature of enterprises combined with poultry and the importance of the poultry enterprise in relation to other enterprises on Oklahoma farms. The completed survey schedule also provided information relative to poultry investments, replacement practices and costs, labor requirements, feeding practices, and other management practices that producers followed.

Classification of Flocks in the Sample

The sixty-one farms were classified according to method of production, floor flocks and cage flocks (Table I). The flocks were grouped according to size, 400-799, 800-1599, and 1600 and over. There were fifteen floor flocks in the 400-799 size stratum. Two of these were hatchery-egg flocks and thirteen market-egg flocks. There were thirteen floor flocks in the size stratum 800-1599. Seven were hatchery-egg flocks and six were market-egg flocks. There were eight floor flocks with 1600 or more birds of which five were hatchery-egg flocks and three were market-egg flocks. The twenty-five cage flocks were also grouped into the three strata, four in the 400-799, thirteen in the 800-1599 and eight with 1600 or more birds.

There were more floor flocks of the size 400-799 hens, and more cage flocks with 800-1599 hens selling market eggs in each county, therefore, more farms were selected from these strata. There were very few

hatchery-egg floor flocks and cage flocks in the size stratum 400-799. Cage flocks with about 1200 birds were more common in the counties surveyed.

TABLE I

NUMBER AND AVERAGE SIZE OF FARM FLOCKS SURVEYED, ACCORDING TO METHOD OF OPERATION AND TYPE OF EGGS MARKETED

Item	Floor						Cage		
	400-799		800-1599		>1600		400-799	800-1599	>1600
	Hatchery	Market	Hatchery	Market	Hatchery	Market	Market	Market	Market
Number of flocks	2	13	7	6	5	3	4	13	8
Average size	440	519	1052	1075	3720	2162	618	1190	2255

Summary

The poultry enterprise is an important segment of the agricultural economy of Oklahoma, ranking sixth among the principle crop and livestock enterprises of the state. The farms with poultry in Oklahoma are decreasing in number, but the size of flocks on the remaining farms are getting larger. Therefore, this study only considers the farms with commercial poultry flocks.

The study was based on data obtained from sixty-one commercial operators interviewed during the period, September 1, 1958 to July 15, 1959. The sample included flocks with more than 400 layers with cage or floor plan method of production, selling either market or hatching eggs.

CHAPTER II

MANAGEMENT OF THE POULTRY ENTERPRISE

Farm management is a subdivision of economics which considers the allocation of scarce resources within an individual farm. It is a science of choice and decision making, and thus is a field requiring studied judgment.[1] Farm management has two closely interrelated areas of activity: (1) farm organization, and (2) farm operation.

Farm organization is primarily concerned with determining the size of farm, choice of enterprises and their respective size, the combination of resources which will be allocated to each enterprise as well as the capital structure[2] and the adoption of general policy and goals for the farm business.[3] Organization, however, does not stop once a farm is a going concern. A farm requires continuous reorganization of its resources among different alternative uses, if it continues as an efficient economic unit.[4]

Operation is concerned with running this organized farm as a going concern and making the day-to-day decisions that are common on farms.

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[1]Earl O. Heady and Harold R. Jensen, Farm Management Economics (New York: Prentice-Hall, Inc., 1954), p. 6.

[2]J. R. Hicks, Value and Capital (Glasgow: Oxford University Press), Second Edition, (1956), pp. 78-98.

[3]C. L. Homes, Economics of Farm Organization and Management (Boston: D. C. Heath and Company, 1928), p. 13.

[4]Glenn L. Johnson and Cecil B. Haver, Decision Making Principles in Farm Management, Missouri Agricultural Experiment Station Bulletin 593, January, 1953, p. 7.

The success of the second phase of farm management depends considerably on the managerial aptitude for organizing and the inclination to reorganize and make changes. Continuous reorganization implies a revaluation of either existing cost-price relationships or expected relationship. Poultry producers discontinue an enterprise or practice when cost-price relationships are unfavorable. A practice may be adopted in anticipation of more favorable price-cost relationships. The new situation could be interdependent of the practice but also directly affected by the practice.

Imperfect knowledge and continuous change compounded by errors of judgment in predicting price-cost relationship create elements of risk and uncertainty.[5] Farm managers acting objectively to formulate ideas to enable them to make rational choices and decisions precede such action by observing and analyzing events and evaluating the consequences of the actions to be taken. In addition to these functions, poultry managers perform the roles of laborers and also supervise and integrate the enterprise into the farm business. These functions of management can be summarized as follows: (1) observations, (2) analysis, (3) decision concerning the problems under consideration, (4) action-taking, and (5) acceptance of economic responsibility. These roles are not necessarily individualistic or independent. In fact, most agricultural economists usually limit the functions to four, as categories one and two are combined into one function. In all probability, the decision to observe a particular event presupposes that the problem has been partially defined, thus the third function becomes integrated with the first two

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[5] Ibid., p. 8.

roles. Hence, the number could be reduced to three distinct functions. The number may be arbitrary, however, the greater number seems to facilitate analysis of what managers do, and the relevant events, or that part of the economic system investigated. "The first task of economic analysis is to select from economic events and facts those elements which are significant in relation to the general scheme of economic analysis itself."[6]

Managers, in general, as well as poultry managers specifically, perform their roles as rationers of scarce resources within well defined areas of economic events. These areas are:[7] (1) price structures and changes, (2) production methods and responses, (3) prospective technological developments, (4) the behavior and capacity of people associated with farm business, and (5) the economic, political, and social situations in which a farm business operates. The importance of these areas to the poultry industry as a whole cannot be adequately developed here. An individual manager of a poultry enterprise may have attained acceptable levels of knowledge in most of these areas of action. However, continuous changes within all areas may bring about unacceptable levels of knowledge and performance.

Price and price relationship changes are continuous, reflecting increases in the supply of factors and products, and changes in demand. The unfavorable price-cost changes in the egg-feed price ratio in 1959

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[6]Kenneth Boulding, Economic Analysis, (New York: Harpers, 1941) p. 6, and Kenneth Parsons, "Foundations of Economic Research," Journal of Farm Economics, Vol XXXI, No. 4, (November, 1949), p. 673.

[7]Op. Cit., Johnson and Haver, p. 8.

were likely anticipated by some producers, and not by others, since egg production was probably increased in anticipation of favorable price relations.[8] Egg production results only from a plan of action that was set in motion months prior and is continuous through time. A poultry manager may be induced to enter the market at one price-cost relationship and forced to discontinue when unfavorable conditions exist to protect the capital structure of the farm.

Production methods and responses change as new technology develops. Improved technology renders old technology obsolete in that either more product output can be produced with a given resource input, or less resource input required for a given product output. This would mean that a poultry producer could either increase the size of the poultry enterprise or use the resources formerly used in poultry production on other enterprises. Since poultry flocks are getting larger, it is likely that poultry producers are using underemployed fixed resources such as buildings, labor, and management to expand the poultry flock.

Before a technological change can be classified as an improvement, the new technique or method must either produce more product with the same input or the equivalent with less input. Improvements in technology of the poultry enterprise may be in several different forms. It may be

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[8]The object of expanding production could arise from anticipation of unfavorable price-cost relationship; provided, the increased scale of operations results in either greater returns to the fixed resources in which are included the operator's labor and management under the alternative chosen or a decline in average cost which would be greater than the anticipated decline in prices. In both situations MR is equal to or greater than MC. In the first situation AC may exceed MR but it is necessary that the differential decline with expansion in production or the purpose of such a course of action is defeated.

a change in layer-housing design, machinery, equipment, breed, or strains, feed rations, and managerial practices.

Since resources required in poultry production are either fixed in quantity such as labor, buildings and management, or purchased competitively such as feed, chicks, etc., technological advances in poultry production which increase the output of fixed resources are usually assumed to lower average cost per unit of output. This does not necessarily follow, if, (1) the object were to increase the quality of the product, eggs, or (2) if the object were to increase the returns to a fixed resource only, such as the operator's labor and management, all other costs being considered as variable.

Most technological improvements require large operations to justify the additional investment required by the new innovation. This may be an explanation for the trend toward larger flocks in Oklahoma. For an example, mechanical egg graders and washers, and automatic feed and water systems reduce labor requirements, but increase the amount of capital required by the poultry enterprise. For a poultry producer (manager-laborer) to invest in these labor saving devices, he needs to transfer the labor released to another enterprise that offers an opportunity for employment, which is greater than the cost of the additional capital investment. This suggests a labor-capital substitution problem in which a poultry producer must decide how much capital can be profitably substituted for labor. The answer to a question of this nature depends on the substitution rate of capital for labor on each individual farm and the value of the marginal physical product of both labor and capital.

Basic Principles of Management

Production or output per unit of fixed resources revolves around the law of diminishing returns. This law states that, "if the input of one resource is increased by equal increments per unit of time while the inputs of other resources are held constant, total product output will increase, but beyond some point the resulting output increase will become smaller and smaller."[9]

Poultry producers are governed either directly or indirectly by this law, in making decisions pertaining to the poultry enterprise as well as decisions pertaining to the total farm operations. The principle of diminishing returns is important in specifying how large the poultry enterprise should be or how much labor or capital should be added to the present unit.

There are possibilities of increasing returns to some extent in poultry production. Increasing returns imply that doubling of resources will more than double output. For example, to double egg production and income, a poultryman would probably need to double hen numbers and feed, but buildings, equipment and labor may not necessarily be increased in the same proportion. Theoretically, both increasing and diminishing returns occur in poultry production, that is, as variable resources are added to fixed resources output at first increases at an increasing rate to a point where output increases at a diminishing rate. However, this

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[9]Richard H. Leftwich, The Price System and Resource Allocation, (New York: Rinehart and Company, 1955), p. 105.

concept cannot be empirically tested by the data in this study of resource efficiency. If rational behavior is assumed, the level of production has reached decreasing returns per unit of input.[10]

The profit maximizing principle states that under conditions of either increasing or decreasing output, it is profitable, if capital is available, to increase the level of output or production as long as the added return is greater than the added cost.

For example, it would be profitable for poultry producers to feed the laying flock to a point where an additional unit of output would just pay for the additional unit of feed. The principle is an effective guide for selecting the number of layers to be placed in a given building space.

The principle of substitution in choice of practices or resources also is an important principle to poultry managers.[11] The profit maximizing principle indicates whether it is profitable to produce at a given output, but this output may be produced by two or more methods or combinations of resources, e.g., eggs may be produced either by cage, colony, or floor plan method of production. The principle of substitution indicates which practice should be adopted, or what resource substitution should be made. It affords a tool by which a poultryman can decide whether to use the cage or floor plan method of production or whether to maintain a pullet flock or keep old hens.

The principle of substitution is a continuous process of evaluating production techniques which may or may not disturb resource relationships.

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[10] Ibid., p. 107.

[11] Heady, Op. Cit., pp. 54-72.

One type of feed may be substituted for another without changing the proportion of factors but results in additional increments of output. Many alternative practices of production confront poultry managers which create an infinite number of combinations of resources. Examples of these practices are: (1) to raise or purchase pullets, (2) to confine hens to individual cages or use the alternative, floor plan, (3) to use lights, (4) to heat water in the laying house during winter months, (5) to produce eggs for hatchery or table purposes, (6) to clean and grade eggs, and (7) to use mechanical devices for feeding, ventilating, egg gathering and temperature controls, etc. The practice for an individual poultryman with a given resource combination will differ from that of another combination since each farm is a unique resource situation. However, the general principle applies in all instances. Although the data for the poultry study were not adequate to analyze these practices for each individual producer in the survey, it did furnish information regarding these practices that will aid individual producers in making these decisions relative to the choice of practices and resource combinations.

CHAPTER III

COMMERCIAL FARM POULTRY-EGG PRODUCTION IN OKLAHOMA

Trends in Poultry Production

The average number of layers on Oklahoma farms has declined since reaching a peak of 11,540,000 in 1944 to a low of 4,289,000 in 1958 (Appendix B). During the period from 1950 to 1954, there was a marked difference in farms reporting poultry in Oklahoma (Table II).

TABLE II

NUMBER AND PERCENT OF FARMS REPORTING POULTRY ON COMMERCIAL FARMS, OKLAHOMA, 1950-54, BY SIZE OF FLOCKS

Size of Flock	All Commercial Farms			
	1954		1950	
	Number	Percent	Number	Percent
<400	55,397	98.46	120,803	99.672
400-799	727	1.29	346	.285
800-1599	86	.15	43	.035
1600-3199	31	.06	2	.002
>3200	21	.04	7	.006
Total	56,262	100.00	121,201	100.000

Source: United States Census of Agriculture: 1954, Volume 1, Part 25, pp. 276-77, Table 11. United States Census of Agriculture: 1950, Volume 1, Part 25, pp. 166-67, Table 3.

In 1950, there were 121,201 commercial farms reporting poultry, compared with only 56,262 farms reporting poultry in 1954. However, there

was a significant increase in the number of farms reporting flocks with more than 400 birds. Although the number of flocks in Oklahoma, as indicated by the number of farms reporting poultry has decreased, the size of flocks has increased. This was also supported by the study of 61 commercial poultry producers in Oklahoma (Table III).

TABLE III

TREND IN AVERAGE FLOCK SIZE OF SURVEYED FARMS (1956-58), BY METHOD OF PRODUCTION, AND SIZE OF FLOCK

	Floor			Cage		
Year	400-799	800-1599	> 1600	400-799	800-1599	>1600
1958	501	1066	3137	617	1173	2254
1957	358	462	1978	520	1038	2244
1956	318	462	1566	322	1039	1315

The cage producers did not show as rapid an increase in average flock size over the three-year period as floor plan producers. A logical explanation for this is, that the the increase in size of the cage flock was due almost entirely to increased capacity of houses and equipment. Most of the increase in the floor flock size was achieved by placing more birds in existing buildings, utilizing more fully the equipment that was in the poultry buildings.

Contributing to the downward trend in number of layers in Oklahoma, has been the cost-price squeeze.[1] Average egg prices in 1958 were the

[1]Note: The cost-price squeeze infers that (1) the price of product decreases faster than the cost of production, (2) the price of product increases slower than cost of production, (3) or price of product decreases and cost of production remains unchanged or increases.

lowest since 1942. However, the costs of production have not decreased in comparison with the decline in egg prices. To overcome the price-cost squeeze, poultrymen have attempted to find means of lowering production costs. Lower product costs have been obtained by a combination of the following: (1) increasing the average rate-of-lay per hen through improved strains of chickens, improved feeds and improved management practices and holding other costs constant; and, (2) reducing the resource input per dozen eggs produced. The resource usually reduced per unit of output was labor. Poultry, a labor intensive enterprise, lends itself well to labor-saving equipment such as automatic waterers and feeders, mechanical egg washers, graders, and various other automatic devices.[2] The amount of labor per 100 hens was also reduced on many Oklahoma farms by increasing the size of flock, and arranging buildings and equipment to fit labor-saving methods.

The trend toward larger flocks in Oklahoma was motivated by several factors, however, the study indicated that the primary objective was to increase the efficiency of labor, that is, to enable labor to utilize more capital per unit of time. Labor cost and investments in equipment per 100 birds decreased as the size of flock increased.[3] Routine chores required approximately the same amount of labor irrespective of flock

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[2]Labor intensive enterprises refer to enterprises where the ratios of labor to capital are relatively high. Therefore, the returns are considered to be low to labor compared with returns to capital. This indicates that poultrymen substitute capital for labor. Assuming marginal returns to capital to be equivalent to or greater for poultry compared with other alternatives additional capital is attracted to the enterprise.

[3]R. N. Van Arsdall and Thayer Cleaver, Less Labor in Egg Production, Illinois Circular, 785, p. 3.

size. Going to and from the laying house, for example, takes as much time for 100 birds as for 1000 birds. The average poultryman spent 10 hours and walked 20 miles a year in making one round trip to the laying house, according to the Illinois study.[4] Since the average poultryman makes three to five trips to the laying house each day, up to 50 hours and 100 miles of walking are used each year to combine the labor resource with the poultry enterprise. The chores inside the laying house such as opening and closing doors, servicing equipment, checking mechanical devices and cleaning the egg room required about the same amount of time regardless of the size of flock. Equipment that required about the same investment for different size flocks include the water system and power lines leading to the laying house, wagons, manure spreaders, carts, carriers, elevators, and other equipment for handling materials. In addition, most of the material or equipment for processing and storing feed and eggs are not functionally related to scale of operation. The size of these facilities are likely to influence the number of days that eggs are held and the frequency of feed purchases.

Factors that Influence Decision Making

Management makes decisions based on past and present conditions and future expectation of costs and prices of resources and products and also the flexibility of existing resources. It was postulated that the amount of poultry buildings, equipment, and labor available were important factors in making decisions related to the poultry enterprise in 1958. Due to the lack of data, these assumptions could not be evaluated. It

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[4] Ibid.

was necessary to ask managers what were the forces motivating their actions to continue the enterprise or to expand. A more complete analysis would have required data from producers who had disinvested capital during this same period. Poultry producers interviewed were asked to indicate what factors were important to them in making a decision to expand, contract or maintain the same size poultry flock during 1958 compared with 1957 (Table IV). Expected egg prices for 1958 were reported as the determining factor by 42 per cent of the producers. These producers were generally centered around marketing centers where prices of eggs were maintained at relatively high levels. This was made possible by house to house deliveries, and direct deliveries to stores and restaurants, thereby insuring a certain price provided a specified quantity and quality were delivered each week during the year. Improved management practices generally assured a constant supply of high quality eggs during the season.

Expected feed price relationships were important to 35 per cent of the poultry producers. Very few farmers expected prices of commercial feeds to decline, however, an increased supply of home grown grains was expected to be marketed at higher prices through feeding it to the poultry flock. A smaller percentage of the cage producers reported feed prices as an influencing factor compared with producers using floor flocks. Most cage producers did not feed whole or cracked grain separately or in addition to the processed grains of the commercially mixed feed. Seventy-eight per cent of the producers in the survey indicated that improved strains of chickens or more efficient layers were expected to either offset a slight decline in egg prices or reduce costs. The

TABLE IV

FACTORS INFLUENCING MANAGEMENT DECISIONS ON SURVEYED FARMS, BY METHOD OF PRODUCTION AND SIZE OF FLOCK

		Floor			Cage		
	All Flocks Percent	400-799 Percent	800-1599 Percent	>1600 Percent	400-799 Percent	800-1599 Percent	>1600 Percent
Expected Egg Prices	42	46	50	50	33	30	37
Expected Feed Prices	35	46	50	50	50	0	25
Improved Strains Available	78	93	91	75	75	69	50
Poultry More Profitable	62	53	66	62	75	61	62
Buildings & Labor Available	63	93	83	62	75	30	25
Secured Egg Marketing Contract	45	26	50	75	50	38	50
Operating Capital Available	93	100	91	75	100	92	100

increase in rate-of-lay per hen, per unit of time, was seldom given as a factor affecting the decision, to expand the size of flock.[5] The poultry enterprise was indicated by producers as being the most profitable enterprise on small farms where labor had few alternative uses.

The poultry enterprise has been an important enterprise in using family labor on Oklahoma farms. Ninety-five per cent of the farms interviewed used family labor for the total poultry labor requirements. The relatively low capital requirements of the poultry enterprise encouraged the utilization of underemployed family labor or the type of labor that was unable to compete for employment in other enterprises. Therefore, the availability of labor and buildings continued to be one of the most important factors influencing the decision to retain the poultry enterprise during 1958. These factors also had considerable affect on the size of flocks that were to be retained in 1958.

There were only three of the sixty-one producers interviewed who indicated that labor was hired for the poultry enterprise. A few farmers hired houses cleaned once or twice a year, giving the manure in exchange for the labor. Of the three producers that hired labor, one hired labor for cleaning, grading, and packaging eggs only. Each of the other two producers hired an employee to furnish both labor and management for the poultry flock.

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[5]Morley A. Jull, Poultry Breeding, (New York: John Wiley & Sons, Inc., 1952), p. 267. The more efficient layer requires a smaller quantity of other resources per unit of output, whereas the increased rate-of-lay per hen pertains to the output per unit of time and not the input-output relationships. The added output of eggs resulting from each additional input of feed declines only slightly as hens are given more feed; therefore, maximum physical feed input is the most profitable level of input. Studies show that 70 per cent and more of the feed is used by the hen for maintenance of body weight and 27 per cent for egg production.

Forty-five per cent of the producers indicated that egg marketing contracts had been secured. These contracts were informal agreements in which the buyers agreed to purchase a specified quantity of eggs each week throughout the year. A very large percentage of the hatchery-egg flock producers reported this type of agreement.

Classification of Surveyed Farms

The poultry producers were asked to classify their farm operations according to resource use. These resources were considered to be land, labor, capital, and management. All livestock and crop enterprises were considered under these two broad classifications. Only twenty-seven producers or 44.0 per cent of all producers considered the poultry enterprise as the major resource user (Table V). The operators of the larger size strata were more consistent in classifying their farms as poultry farms than were the smaller flock owners.

TABLE V

CLASSIFICATION OF SURVEYED FARMS ACCORDING TO RESOURCE USE, BY METHOD OF PRODUCTION AND SIZE FLOCK

Types of Farming	Floor			Cage			Total Flocks
	400-799	800-1599	>1600	400-799	800-1599	>1600	
	(Percent)						
Poultry	27.0	54.0	50.0	25	39.0	75.0	44.0
General	33.0	15.0	13.0	25	31.0	12.0	23.0
Part-time	7.0	15.0	12.0	50	23.0	13.0	16.0
Crops	13.0	8.0	0	0	8.0	0	10.0
Livestock	20.0	8.0	25	0	0	0	7.0

General farming included all farms on which no single enterprise or group of enterprises used 50 per cent of the total resources. Twenty-three per cent of the poultry farms were in this classification. Part-time farms were considered to be farms where a major portion of the labor resources was used in off-farm employment. Sixteen per cent of farms were considered as part-time. The small cage flocks with 400 to 1000 birds were common on this type of farm. Only one cage producer estimated that crops and livestock required over 50 per cent of the total farm resources. Crops used more than 50 per cent of resources on 10.0 per cent of farms surveyed. These farms were located in western Oklahoma where small grains were the major enterprise. Only 7.0 per cent of the farmers interviewed indicated that livestock enterprises were the major resource users. Dairying was not listed as a major enterprise in resource use.

The poultry enterprise was also classified by each poultryman according to gross income received from poultry (Table VI). Poultry was considered a major enterprise on farms where 50 per cent or more of gross income was contributed by poultry. It was classed as a minor enterprise if 25 to 50 per cent of gross income was contributed by it, and as a sideline if it amounted to less than 25 per cent. Poultry was the major source of gross income on 64.0 per cent of all farms surveyed. Nineteen per cent of the farms classified poultry as a minor enterprise, and 17.0 per cent as a sideline enterprise. A larger percentage of the cage producers with more than 1600 hens considered poultry as the major enterprise. Most of the producers who indicated that poultry was a sideline enterprise were the owners of large size farms or were part-time farmers.

TABLE VI

CLASSIFICATION OF POULTRY ENTERPRISE ACCORDING TO GROSS INCOME, BY METHOD OF PRODUCTION AND SIZE OF FLOCK

Classification	Floor			Cage			All Flocks
	400-799	800-1599	>1600	400-799	800-1599	>1600	
	(Percent)						
Major	54.0	67.0	63.0	50.0	62.0	88.0	64.0
Minor	31.0	8.0	12.0	25.0	23.0	12.0	19.0
Sideline	15.0	25.0	25.0	25.0	15.0	0	17.0

Characteristics of Surveyed Farms

The poultry enterprise required a relatively small amount of land area. The average size of the surveyed farms was 241 acres compared with 299.5 acres in all farms in 1954.[6] The land in farms was classified as 138 acres of pasture land and 103 acres in crops (Table VII).

TABLE VII

AVERAGE SIZE OF SURVEYED FARMS, BY METHOD OF PRODUCTION AND LAND USE

Production Type	Pasture*		Crops		Total	
	Acres	Percent	Acres	Percent	Acres	Percent
Floor	115.0	43	133.0	57	268.0	100
Cage	170.0	83	35.0	17	205.0	100
All Farms	138.0	57	103.0	43	241.0	100

*Includes all land not used as cropland.

[6]United States Census of Agriculture, 1954, Vol. 1, Part 25, p. 12, Table IV.

The average size farm with cage flocks was 205 acres of which 170.0 acres or 83 per cent was pasture land and 35.0 acres or 17 per cent of land was in crops. The average size farm with floor-plan flocks was 268.0 acres, of which 115.0 acres or 43 per cent was pasture land and 153.0 acres or 57 per cent was crop land. The location of cage producers was likely the primary reason these farms had only 17 per cent of the land in crops. Most cage producers were located near residential areas and were on farms where very little crop farming was practiced.

Investment in Land and Buildings

The average investment in land and buildings on the surveyed farms was $32,208 per farm or $134 per acre compared with only $18,913 per farm or $63.89 per acre on all farms in 1954.[7]

The floor-plan producers with more than 1600 birds had the highest average investment per farm (Table VIII). However, the farms with cage flocks had the highest investment in land and buildings per acre. These farms had an average investment in land and buildings of $160, while farms with floor-plan flocks had $126 per acre.

The explanations for larger average investment in land and buildings, on the farms included in the survey compared with all farms in 1954 are likely related to factors other than the poultry enterprise: (1) the surveyed farms were not far from heavily populated districts, (2) the value of land as well as buildings has increased more in comparison with farms at a greater distance from population centers since 1954, (3) the value of poultry buildings is larger on commercial poultry farms than the

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[7] Ibid.

average of all farms in Oklahoma, and (4) the study was concentrated in counties which do not have large areas of relatively low land values.

The poultry enterprise accounted for only 14.6 per cent of the total investment in land and buildings on all surveyed farms.

TABLE VIII

AVERAGE INVESTMENT IN LAND AND BUILDINGS OF SURVEYED FARMS, BY METHOD OF PRODUCTION AND SIZE OF FLOCK

Average Investment	Floor 400-799	Floor 800-1599	Floor >1600	All Floor Flocks	Cage 400-799	Cage 800-1599	Cage >1600	All Cage Flocks	All Flocks
Per Farm	21,933	36,583	45,625	32,371	38,750	27,808	35,375	31,980	32,208
Per Acre	107.00	117.00	172.00	126.00	172.00	129.00	220.00	160.00	134.00

Investment in Farm Equipment

Investment in farm machinery per farm was significantly different between the two methods of production (Table IX). However, the difference was attributed to the type of farming rather than the poultry enterprise. The farms with floor-plan flocks combined more livestock and crop production with their poultry enterprise than producers with cage flocks. There were not as many acres of crop land on farms with cage flocks as on farms with floor flocks. The total machinery investment per farm with floor-plan flocks was $5,652 and the highest machinery investment per farm was reported by the farms with 400-799 size floor flocks. Cage producers reported the reverse relationship. The average machinery investment was only $2,852 per farm on farms with cage flocks, but farms with more than 1600 layers had the highest investment per farm and per acre.

TABLE IX

AVERAGE INVESTMENT IN FARM MACHINERY ON SURVEYED FARMS, BY METHOD OF PRODUCTION AND SIZE OF FLOCK

	Floor			All	Cage			All	
	400-799	800-1599	>1600	Floor Flocks	400-799	800-1599	>1600	Cage Flocks	All Flocks
Investment Per Farm	5901	5508	5400	5652	2400	2561	3550	2852	4485
Investment Per Acre	28.00	18.00	20.00	22.00	11.00	12.00	22.00	14.00	19.00

It was evident that the investment in farm machinery was independent of the poultry enterprise where the floor-plan method of production was practiced. The positive relationship between size of flock and investment in machinery as indicated by the survey of cage producers does not warrant a conclusion due to the small sample.

Investment in Poultry Buildings and Equipment

The average investment in poultry buildings and equipment on all farms surveyed was $4161 per farm or $320 per 100 layers (Table X). Investment in laying houses accounted for 60 per cent of the total investment compared with 40 per cent for other buildings and equipment. The laying house investment per 100 layers per farm contributed a larger portion to total investment with floor flocks than with cage flocks. This was explained by the additional investment in cages.

There was a marked difference in investment of poultry buildings and equipment between the two methods of production, therefore, the average investment of all flocks should not be used as guides in determining

TABLE X

AVERAGE INVESTMENT IN POULTRY HOUSING AND EQUIPMENT PER FARM AND 100 LAYERS, BY METHOD OF PRODUCTION AND SIZE OF FLOCK SURVEYED

Items	Floor			All Floor Flocks	Cage			All Floor Flocks	All Flocks
	400-799	800-1599	>1600		400-799	800-1599	>1600		
Average Size Flock	519	1,062	3,138	1,293	618	1,185	2,626	1,360	1,317
Investment Per Farm:									
Laying House[a]	1,167	1,918	4,459	2,170	1,888	3,186	3,790	3,047	2,483
Others[b]	520	930	2,496	1.107	1,181	2,790	3,983	2,707	1,678
Total	1,687	2,847	6,955	3,276	3,069	5,976	7,773	5,754	4,161
Percent of Investment Per Farm:									
Laying House	69	67	64	66	62	53	49	53	60
Others	31	33	36	34	38	47	51	47	40
Investment Per 100 Layers:									
Laying House	220	180	140	170	310	270	140	220	190
Others	100	90	80	90	190	230	150	200	130
Total	320	270	220	260	500	500	290	420	320
Percent of Investment Per 100 Layers:									
Laying House	69	67	64	65	62	54	48	52	59
Others	31	33	36	35	38	46	52	48	41

[a]Investment does not include labor.

[b]Others include all equipment and buildings except laying houses.

the investment in poultry buildings and equipment.[8] In order to use these figures in the table as guides, a poultryman should choose the method of production and the size of enterprise that corresponds with his particular plans. The average size of all floor-plan flock was 1293 layers with an average investment of $302 per 100 layers.

The floor-plan flocks in size stratum 400 to 799 had an average investment of $320 per 100 layers compared with size stratum 800 to 1599, with an investment of $270 per 100 layers and flocks with more than 1600 layers with an investment of $320 per 100 layers.

The cage flocks averaged 1,360 layers per flock with an investment of $420 per 100 layers or $4161 per farm. The two sizes, 400-799 and 800-1599, had equal investments in housing and equipment per 100 layers. The investment for these two strata was $500 per 100 layers compared with $290 for the stratum with more than 1600 layers.

The amount of floor space provided for each 100 layers was an important factor which affected investment in buildings and equipment per 100 layers. This was the primary factor which accounted for the higher investment in poultry buildings and equipment of cage flocks with 800 to 1599 layers compared with 400-799 layer size cage flocks. The floor space for each 100 layers in 1958 averaged 326 square feet for all flocks (Table XI). The floor flock producers provided an average of 350 square feet per 100 layers compared with 291 square feet with cage operations. The floor-plan group had hatchery flocks that included the

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[8]These housing figures do not provide a basis for estimating construction costs in that they represent an average of many different types of houses and construction material.

heavier breeds which required more floor space. The producers with both methods of production in size stratum 800-1599 provided more floor space per 100 layers than the other two size strata. However, there was not a significant difference between the two larger floor-plan group but the larger size cage producers were using the smallest amount of floor space. Producers in the 800-1599 stratum provided an average of 341 square feet per 100 layers compared with 275 square feet for the larger stratum.

TABLE XI

AVERAGE FLOOR SPACE PER 100 LAYERS HOUSED, SEPTEMBER 1, 1958, BY METHOD OF PRODUCTION AND SIZE OF FLOCKS SURVEYED

Method of Production	Size Flock			
	400-799	800-1599	≥1600	All Sizes
Floor	273.0	365.0	367.0	350.0
Cage	280.0	318.0	268.0	291.0
All Flocks	275.0	341.0	329.0	326.0

Several factors contributed to the difference in total investment between floor-plan and cage flocks. These were: (1) cage flocks required a larger investment in laying house equipment, (2) the average floor-plan laying house was constructed cheaper than the average cage house, (3) floor producers stocked at a heavier rate, and (4) floor flocks had less investment in egg handling equipment, storage and cooling facilities. All hatchery-egg flock breeders used the floor-plan method. Only one graded the eggs and used refrigerated storage facilities.

Regression analysis was used to determine the relationship between size of flock and total investment in buildings and equipment for the two production methods.

Total investment in poultry buildings and equipment was estimated from data obtained from the producers surveyed (Figure 2). The top curve represents an estimate of investment in cage flocks; the lower curve represents an estimate of investment in floor-plan flocks.[9]

The average investment in buildings and equipment per 100 layers for the two methods of production was estimated from the two regression curves (Figure 3). The economies of scale were more prevalent with cage flocks than with floor flocks. The average estimated investment per 100 floor-plan layers decreased slowly from 400 to 1600 layers, leveling off at about 1600 layers. However, the average investment per 100 layers in cage flocks decreased rapidly from 400 to 1200 layers, then slowly decreased until leveling off at about 3200 layers. For example, a poultryman with a 400 size floor-plan flock would have invested in buildings and equipment approximately $350 compared with $960 per 100 layers with the cage plan. However, in comparing a size flock of 2800 birds, the floor flock producer would have $225 per 100 layers compared with $360 for the cage method.

The annual fixed cost[10] as estimated by the regression analyses had the same general characteristics as the total investments between the two methods of production. Depreciation was calculated on a ten-year planning period, since a majority of the commercial poultry producers indicated that most poultry buildings and equipment were carried for the ten years

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[9]The regression coefficients were significant at .01 per cent level. For cage flocks "t" = 3.2, R^2 = .33 and for floor-plan flocks, "t" = 15.1, R^2 = .87.

[10]Includes depreciation, interest, taxes, and insurance.

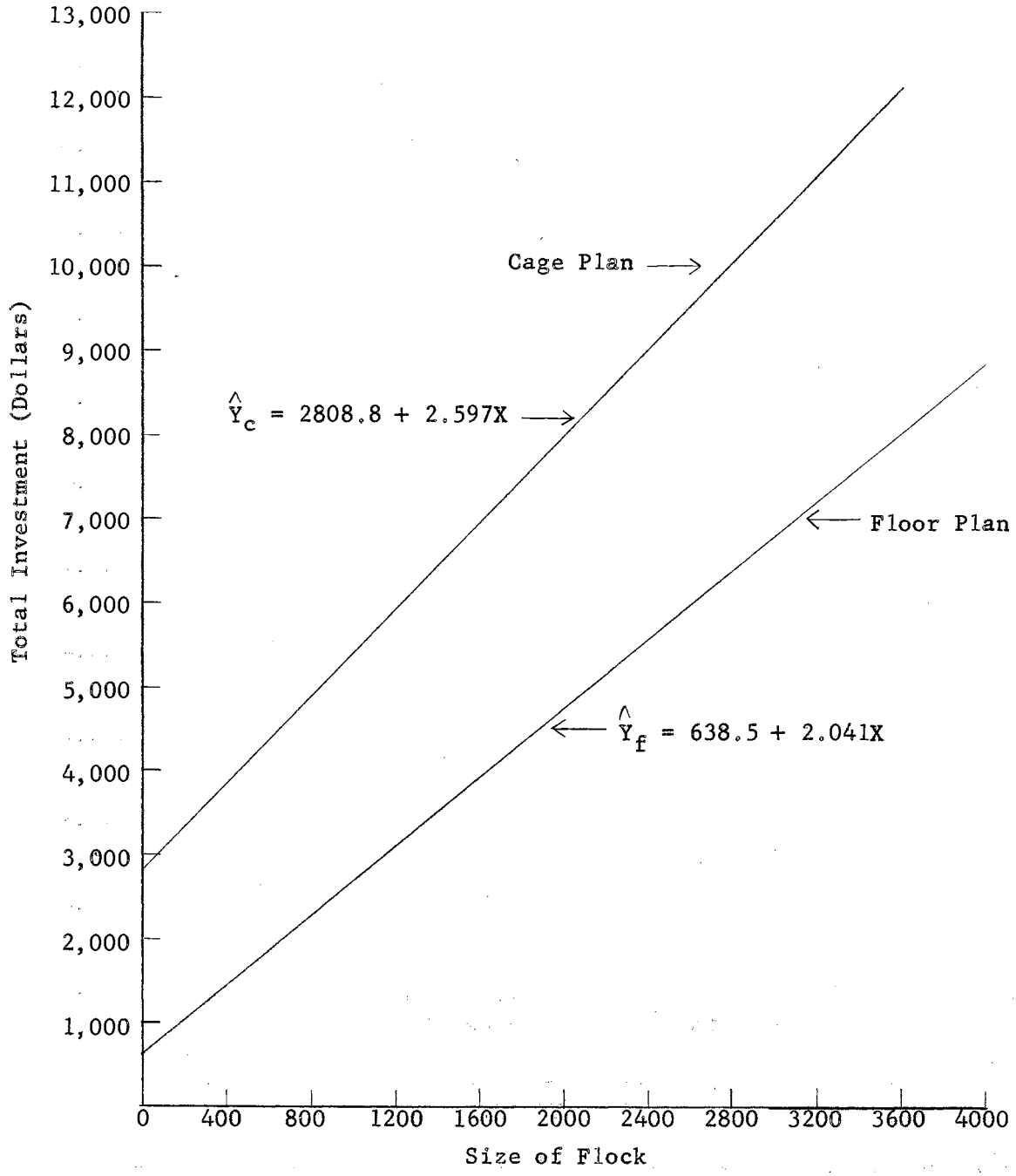

Figure 2: Estimated Total Investment in Poultry Buildings, and Equipment by Method of Production

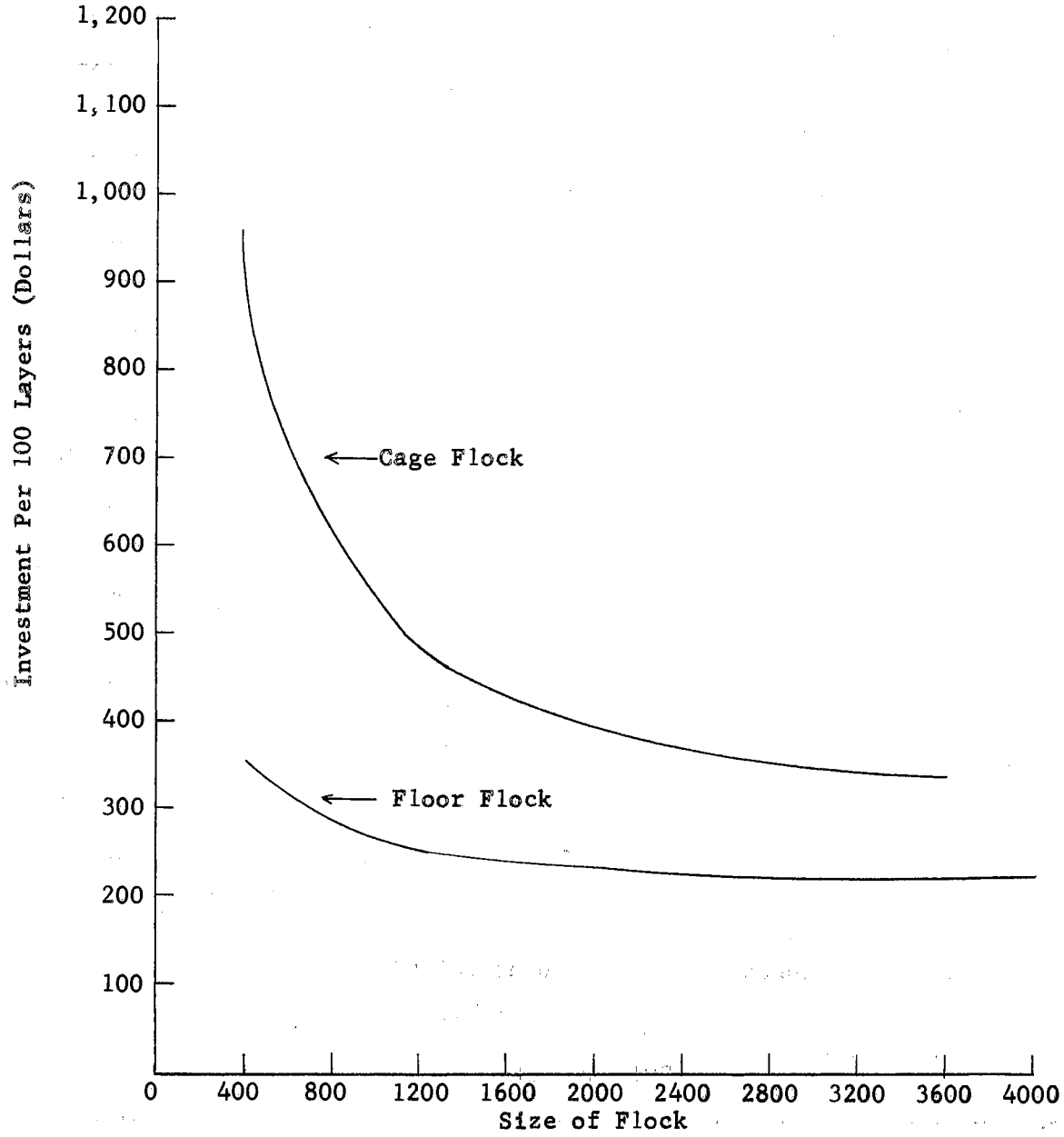

Figure 3: Estimated Average Investment in Poultry Buildings and Equipment Per 100 Layers by Method of Production

on their depreciation schedules. Interest was charged on one-half of the estimated investment, while insurance and taxes were figured on the total estimated investment in poultry buildings and equipment.[11]

The annual total fixed cost for cage flocks was greater than floor flocks (Figure 4). Also, the average annual fixed cost per 100 layers was greater for cage flocks than for floor flocks (Figure 5). A 2000 size layer enterprise requires 34 dozen eggs at $.50 per dozen per 100 layers each year to pay the difference in the annual fixed cost between the two methods. Therefore, it is necessary to either increase production or use less other scarce resources if cage producers compete on the basis of cost with floor-flock producers.

Labor Requirements

Labor was an important resource in commercial egg production. Poultry, a labor intensive enterprise, required labor, which could be used for other alternative enterprises to produce and process eggs. However, a large amount of this labor requirement can be supplied by unskilled family labor that has relatively low productivity in other uses. The total labor requirements were calculated on a weekly (7 day) basis, assuming full capacity, although all producers did not maintain flocks at full capacity for 12 continuous months.

According to the survey, labor requirements per 100 layers varied between the two methods of production as well as between the two types of

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[11]Interest was charged at a rate of seven per cent, insurance was calculated at 20 per cent of total investment at a rate of $5.80 per $100 accessed and taxes were calculated at 70 per cent of total investment, at a rate of $9.50 per $1000 accessed.

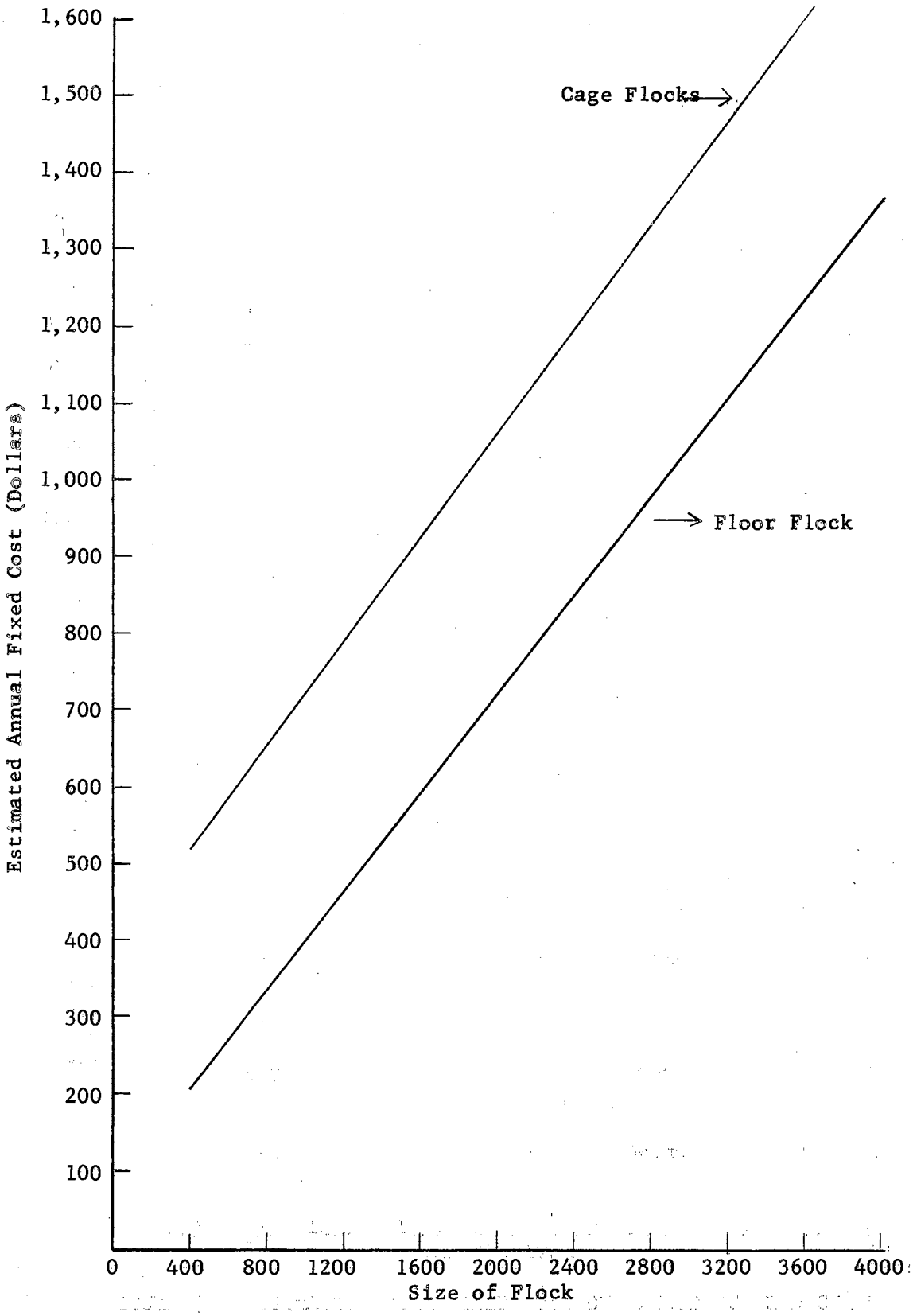

Figure 4: Estimated Total Fixed Cost by Method of Production

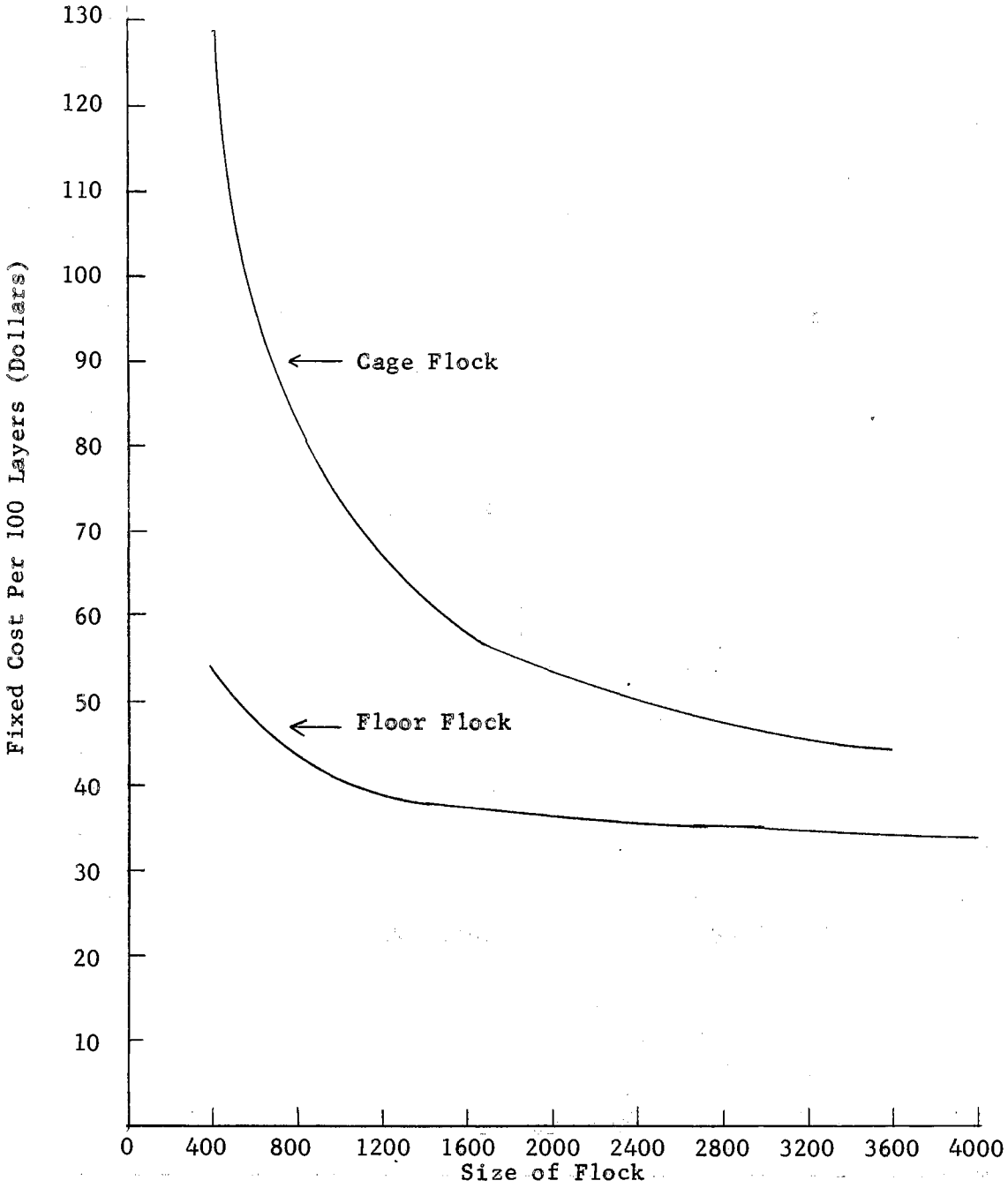

Figure 5: Esimtated Average Fixed Cost Per 100 Layers by Method of Production

market for eggs (Table XII). However, this difference could have been due to either the size of flock or the methods by which eggs were produced and sold. The sample was not large enough to determine a significant negative relationship between labor requirements and size of flock. The market-egg floor-plan producers spent 3.95 hours per week per 100 birds compared with 2.24 hours for hatchery-egg flocks and 2.44 hours per 100 layers per week for cage flocks.

TABLE XII

AVERAGE WEEKLY LABOR REQUIREMENTS OF SURVEYED FARMS, BY METHOD OF PRODUCTION AND TYPE OF EGG MARKET

Item	Floor		Cage
	Market-eggs	Hatchery-eggs	Market-eggs
Number Layers per Farm	924	2030	1435
Hours per Farm	36.47	45.49	34.86
Hours per 100 Layers	3.95	2.24	2.44

Hatchery-egg flocks, with one exception, did not grade eggs and, therefore, required less labor per 100 layers compared with market-egg flocks (Table XIII). This also could have been a factor contributing to situations in which cage flock producers used less labor per 100 layers than market-egg floor producers. Grading eggs for market was practiced on 83 per cent of the floor-plan market-egg flock farms compared with 68 per cent for cage producers and 7 per cent for hatchery-egg flock farms. The one hatchery-egg flock producer who graded eggs indicated that

TABLE XIII

NUMBER AND PER CENT OF SURVEYED FARMS GRADING EGGS FOR MARKET, BY METHOD OF PRODUCTION AND TYPE OF EGG MARKET

Method of Production	Number Surveyed	Farms Grading Eggs	Percent Grading Eggs
Cage			
Market-eggs	25	17	68
Floor			
Market-eggs	22	18	83
Hatchery-eggs	14	1	7

hatchability was increased enough to pay for grading.[12] On this farm, eggs were not washed or candled. Grading eggs constituted the removal of abnormal size and dirty eggs. Those eggs not suited for hatchery purposes were sold to local consumers, ungraded, at reduced prices.

Labor saving devices or equipment were more common on farms with cage flocks than with floor flocks (Table XIV). However, automatic feeders were reported only on floor-flock farms. The three producers which reported automatic feeding devices had more than 2000 layers per farm. Automatic watering devices were used more intensive on cage-flock farms than floor-flock farms. All cage producers used automatic waterers compared with 79 per cent of the floor-flock producers.

A larger percentage of the cage producers had mechanical egg graders, twenty-five per cent compared with only 12 per cent of the floor-flock

[12]Hatchery producers indicated that a premium was received from eggs for each one per cent hatchability over a base percentage of hatchability, (usually $.01 per dozen eggs was paid for each one per cent over 70).

TABLE XIV

NUMBER AND PERCENTAGE OF FARMS REPORTING LABOR-SAVING EQUIPMENT, BY METHOD OF PRODUCTION

Item	Floor			Cage		
	Number Farms	Farms Reporting	Percent Farms	Number Farms	Farms Reporting	Percent Farms
Automatic Feeders	34	3	8.82	24	0	0.00
Automatic Waterers	34	27	79.41	24	24	100.00
Mechanical Egg Grader[1]	34	4	11.76	24	6	25.00
Mechanical Egg Washers	34	10	29.41	24	10	41.67

[1]Provides devices to candle and weigh eggs.

producers. Mechanical egg washers were more common on cage farm than floor-flock farms. Forty-two per cent of the cage producers had mechanical egg washers compared with 29 per cent of the floor-flock producers.

Labor requirements were sub-divided into two classifications, (1) production, and (2) processing. Production included hours spent on chores such as feeding, watering, sanitation and disposing of sick or dead birds. Processing included collecting, cleaning, grading, packaging and marketing. The major portion of the labor was spent on processing jobs (Table XV). However, hatchery-egg producers used a smaller per cent of total labor on processing eggs than did the other two types of producers. These hatchery-egg producers spent 59 per cent on processing. Although this was a substantial portion of the total labor requirements, it was considerably less than the 71 per cent required for processing by the market-egg flocks. As discussed earlier, grading and washing hatchery

eggs was not a common practice on hatchery flock farms, therefore, providing an explanation for a smaller per cent of the total labor and also, less total amount of labor for processing eggs. Cage and floor-plan flocks producing market eggs had the same percentage distribution between producing and processing eggs, however, less total time was spent on farms with cage flocks.

TABLE XV

WEEKLY AVERAGE LABOR REQUIREMENTS PER 100 BIRDS FOR PRODUCING AND PROCESSING EGGS BY METHOD OF PRODUCTION AND TYPE OF EGG MARKET

Type Flock	Production		Processing		Total
	Hours	Percent	Hours	Percent	
Floor					
Market-eggs	1.11	29.0	2.84	71.0	3.95
Hatchery-eggs	.93	41.0	1.33	59.0	2.26
Cage					
Market-eggs	.71	29.0	1.73	71.0	2.44

Labor requirements were divided into the various jobs associated with a commercial egg enterprise (Table XVI). Processing eggs required a larger portion of labor than any other single job for all types of egg production. The second most important single job was collecting eggs except on farms with hatchery-egg flocks which spent more time on feeding the flock than for collecting eggs. Feeding the flock was the third most important single job for market-egg flocks. Marketing of eggs required a smaller per cent of the total poultry requirement on farms which produced hatching eggs than on farms which produced market eggs. This was explained by the size of hatchery flocks. The majority of these

TABLE XVI

WEEKLY LABOR REQUIREMENTS PER FARM AND 100 BIRDS, BY JOB, METHOD OF PRODUCTION, AND TYPE OF EGG MARKET, AS ESTIMATED FROM SURVEY OF COMMERCIAL POULTRY PRODUCERS

Job	Market-eggs			Hatchery-eggs			Cage		
	Hours Per Farm	Hours Per 100 Birds	%	Hours Per Farm	Hours Per 100 Birds	%	Hours Per Farm	Hours Per 100 Birds	%
Watering	2.90	.31	8.0	4.25	.21	9.3	1.60	.11	4.6
Feeding	5.89	.64	16.1	12.59	.62	27.7	7.04	.49	20.2
Collect-eggs	7.57	.82	20.8	11.35	.56	24.9	8.28	.58	23.8
Process-eggs[a]	13.56	1.47	37.2	14.11	.70	31.1	12.57	.88	36.0
Market-eggs	5.04	.55	13.8	1.33	.07	2.9	3.91	.27	11.2
Miscellaneous[b]	1.51	.16	2.8	.10	.10	4.1	1.46	.11	4.2
Total	36.47	3.95	100.0	45.49	2.26	100.0	34.86	2.44	100.0

[a]Processing eggs included hours required for cleaning, grading, and packaging eggs.

[b]Miscellaneous included hours required for sanitation, and disposing of sick and dead birds.

flocks were large, and commercial hatcheries picked up their eggs at the farm. Also, market-egg producers spent considerable time selling eggs to local customers at the farm, as well as delivering eggs to stores, produce buyers and on private routes.

The importance of each specific job was measured in percentage of the total labor requirement for each method of production and the types of eggs marketed (Figure 6). The percentage distribution of labor between the various methods of production did not vary significantly except for feeding and processing hatchery eggs.

Indications of a trend toward less labor per 100 hens as the average size of flock increased were presented in the analysis of labor required for the average size flock in each size stratum (Table XVII). The labor

TABLE XVII

WEEKLY AVERAGE LABOR REQUIREMENTS FOR PRODUCTION AND PROCESSING EGGS PER 100 LAYING BIRDS, BY SIZE OF FLOCK AND TYPE OF EGG MARKET, AS ESTIMATED FROM SURVEY OF COMMERCIAL POULTRY PRODUCERS

	Floor						Cage		
	Market-egg			Hatchery-egg			Market-egg		
	400-799	800-1599	>1600	400-799	800-1599	1600	400-799	800-1599	>1600
Production[a]	1.2	1.5	.6	1.1	1.2	.8	1.2	.6	.7
Processing-eggs[b]	3.1	3.2	2.2	6.9	1.7	1.1	3.0	2.0	1.3
Total	4.3	4.7	2.8	8.0	2.9	1.9	4.2	2.6	2.0

[a]Production included labor for feeding, watering, sanitation, and disposing of sick or dead birds.

[b]Processing included labor for collecting, cleaning, grading, casing or cartoning, and marketing.

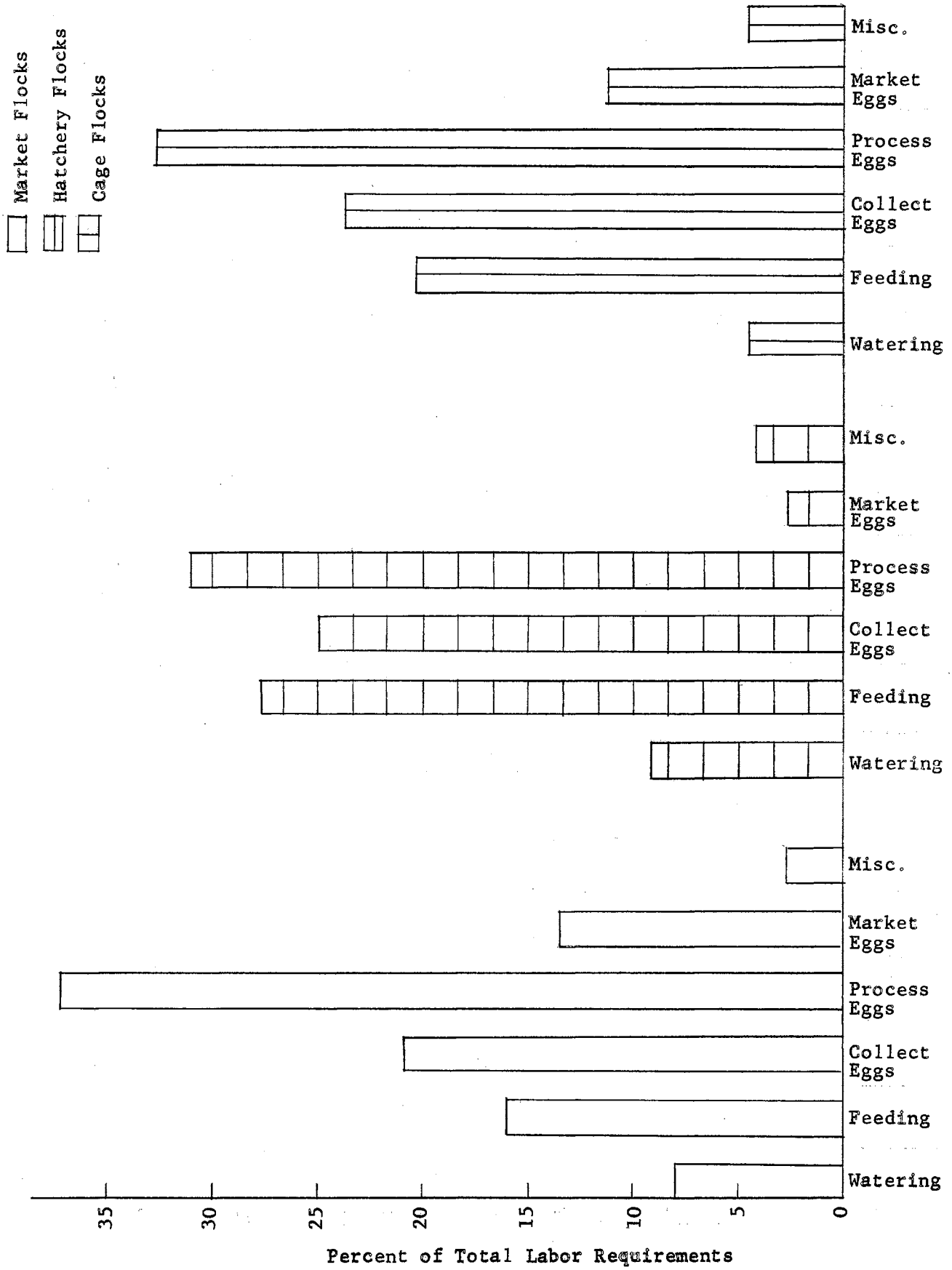

Figure 6: Weekly Labor Requirements by Job, Type Egg Market, and Method of Production on Survey Farms

required per 100 layers decreased from the 400-799 stratum through the 1600 size stratum except for market-egg floor-flocks from the 400-799 to the 800-1599 stratum. Considerable variation existed in each size stratum between the different methods of production and types of eggs marketed. The size stratum 400-799 birds varied from 4.3 hours per 100 layers for floor-flock market eggs and 4.2 hours for cage market eggs to 8.0 hours per 100 layers for hatchery-egg flocks. The other two size strata did not show as much variation between the methods of production and types of eggs marketed.

Feeding Practices

Feeding practices varied between the two methods of production (Table XVIII). The major difference was the combination of feeds which made up the poultry ration. The cage producers usually fed a ration of all-mash. However, floor-plan producers generally fed grain separately from the commercial mash. This was significant in that 88 per cent of the cage producers fed all-mash rations compared with only 6 per cent of

TABLE XVIII

FEEDING PRACTICES OF FLOCKS SURVEYED, BY METHOD OF PRODUCTION

Practice	Cage Percent	Floor Percent
Feed--All-Mash Ration	88.0	6.25
Feed--Mash-Grain Ration	12.0	93.75
Feed--Commercially Mixed	96.0	93.75

the floor producers. Ninety-six per cent of cage producers and 94 per cent of the floor-flock producers fed a feed which had been commercially mixed.

The methods of feeding grains to floor-flocks varied in the amount, time, and manner. Restricted grain feeding was practiced by 72 per cent. Nine per cent of the floor-flock producers fed grain in the morning hours while 63 per cent fed grain in the evening hours. The remaining producers fed grain free choice. Only three cage producers fed grain separately from the commercial ration. These producers followed a restricted plan of feeding grain, late in the evening.

The producers with floor flocks fed grain two different ways: (1) in litter, and (2) in hoppers. Feeding grain in the litter stirs the litter in the process of picking up grain, which helps to keep the litter dry. The grain is usually scattered in a manner that more chickens have access to the grain than if it were fed in hoppers. Fifty-three per cent of the producers fed grain in hoppers compared with 47 per cent who fed grain in litter.

A wet mash was fed by 3.0 per cent of the producers. The two producers who fed wet mash were floor-flock producers. It was fed daily to the flock in restricted quantities. Skimmed milk, a surplus farm product, was reported to be the wetting agent in both instances.

Other Management Practices

Lights were maintained on an average of 17 hours by floor-flock producers compared with 15 hours by cage producers. Artificial lights in the morning hours were more common than lights in the evening. Several

producers maintained lights during the morning hours as well as evening lights.

The floor-flock producers indicated that eggs were collected three times daily compared with two times per day by cage producers.

Water was heated in the winter months on 48 per cent of the floor-flock farms compared with 46 per cent on cage-flock farms. Electrically heated wire was the method by which cage producers heated water; however, floor-flock producers used hot water heaters.

The floor-flock producers generally used litter. However, ten per cent of these producers did not use litter. A large portion of the producers who did use litter followed a practice of building up instead of removing it during the year. Seventy-two per cent used a build-up litter program while 18 per cent removed litter. Cage producers did not use litter on the floor.

Summary

The study of poultry production indicated that farm commercial poultry flocks are increasing in size. Available facilities and buildings, labor, and operating capital were major factors influencing producers to increase size of flocks in 1958.

The average size of the surveyed farms was 241 acres, 138.0 acres of which were pasture land and 103.0 acres crop land. The investment in land and buildings averaged $32,208 per farm studied or $133 per acre. The average investment in farm machinery on all farms was $4,485. The floor-flock producers had on the average $5,652, compared with cage producers who had $2,852 invested in machinery.

The average investment in poultry buildings and equipment was $3,276 per farm or $260 per 100 layers for floor flocks and $5,754 per farm, or $420 per 100 layers for cage flocks. Layer housing investment accounted for 60 per cent of the total investment of the farms studied.

Floor-plan, market-egg flocks required more labor per 100 layers per week than cage flocks or hatchery-egg floor flocks. Processing eggs required more time than producing eggs. Cleaning, grading, and packaging eggs required more time than any other single operation. There were indications that labor decreased as size of flock increased; however, the sample size did not warrant a definite conclusion.

Cage producers usually did not feed grain in addition to the all-mash ration, but this practice was, with two exceptions, a general practice of floor-flock producers.

CHAPTER IV

ANALYSIS OF REPLACEMENT ALTERNATIVES

Continuous commercial egg production at a given level of output during a specified period creates a managerial problem that tends to be perennial. "What method of flock replacement would be the best alternative use of resources?" Its importance in the poultry industry is indicated by the number of replacements required each season. The Agricultural Marketing Service has estimated that 6.2 million chicks were raised for flock replacements in Oklahoma in 1958.[1] Flock depreciation, replacements that would maintain production at a given level of output, accounted for approximately 17 per cent of the total yearly cost of producing eggs according to a Mississippi study.[2] Studies in other states have reported similar results.

There are two common methods of flock replacement used by Oklahoma poultry producers: (1) pullets are purchased at 16-20 weeks of age, (2) day-old chicks are purchased and raised for replacements. Research has been conducted at several land-grant colleges to determine the cost of raising replacements. An Oregon study estimated the cost of raising pullets to production age (approximately 22-24 weeks of age) to be $2.16

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[1] The Poultry and Egg Situation, May, 1959, Agricultural Marketing Service, U. S. Department of Agriculture, PES-201, 1959, p. 26.

[2] D. W. Parvin, Investments, Costs and Returns to Egg Producers, Mississippi Bulletin 544, 1956, p. 12.

per pullet for light breeds.[3] However, a Mississippi study estimated the cost of light breed pullets at $1.78 at laying age.[4]

Raising pullets was the most common method of replacement on Oklahoma farms with commercial poultry flocks, according to the study (Table XIX). Seventy-five per cent of the floor-flock producers raise their replacements compared with 22.0 per cent who purchased started pullets 16 to 18 weeks old. Both methods of replacement were used by 3.0 per cent of the floor-flock producers. However, only 48.0 per cent of the farmers with cage flocks raised replacement stocks compared with 36.0 per cent who purchased started pullets. There were 16.0 per cent of the cage producers who used both methods of flock replacement.

TABLE XIX

METHODS OF FLOCK REPLACEMENT FOLLOWED BY 61 OKLAHOMA COMMERCIAL POULTRY PRODUCERS BY SIZE AND TYPE OF OPERATION

Type (Size)	Method of Replacement			
	Buy	Raise	Both	Total
	(Percent)			
Floor				
400-799	20.0	73.0	7.0	100
800-1599	23.0	77.0	0	100
> 1600	25.0	75.0	0	100
Total Floor Flocks	22.0	75.0	3.0	100
Cage				
400-799	25.0	50.0	25.0	100
800-1599	46.0	46.0	8.0	100
> 1600	63.0	12.0	25.0	100
Total Cage Flocks	48.0	36.0	16.0	100
Total All Flocks	33.0	59.0	8.0	100

[3] M. H. Becker, Egg Production Costs and Returns in Western Oregon, Oregon Agricultural Experiment Station, Bulletin 559, May, 1956, p. 19.

[4] D. W. Parvin, Investment Costs, and Returns to Egg Producers, Mississippi Bulletin 544, May, 1956, p. 7.

The major reason a larger percentage of the cage-flock producers purchased started pullets, as explained by the cage producers, was that a relatively small percentage of the entire flock was replaced at any one time. Since cage producers had a relatively high fixed cost per bird, it was important that each cage be used a major portion of the year. It was necessary to replace birds frequently to keep the cages full. To have raised the replacements would have required a constant brooding program with a relatively small number of chicks in each brood at high cost per bird. Labor was the limiting factor which made the cost of brooding small numbers of chicks prohibitive. A Michigan study reported the average labor cost was $1.02 per chick when less than 300 pullets were raised, compared with $0.84 per chick with 301 to 600 pullets raised and only $0.22 per chick when a larger number of pullets (1709) was raised.[5]

The floor-flock producers did not attempt to maintain full flock capacity contrary to the practice followed by cage producers, and usually sold the entire flock at the end of one or two production seasons. The practices of not replacing birds lost either by culling or through natural mortality resulted in a more uniform flock of the same age than were flocks of cage producers. The floor-flock producers indicated that raising pullets was more economical for their replacement program than buying started pullets, since the major portion of the birds was replaced at one time. The larger quantity brooded reduced labor requirements per replacement raised and increased efficiency of resource unused. The hatchery

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[5]C. C. Hoyt and L. E. Dawson, "Cost of Raising Pullets on Seven Michigan Farms," Michigan Quarterly Bulletin, Vol. 38. No. 4, p. 498.

flock producers interviewed raised their replacements in the laying house since hatchery eggs could not be sold during certain weeks of the year. Raising replacements became a supplementary enterprise for hatchery producers but has more of the characteristics of a complementary enterprise for market-egg producers using the floor-plan method of production and a competitive enterprise with the cage production method. The hatchery producers with heavy hens, selling eggs for broiler purposes, kept layers one production season and replaced the entire flock.

Other reasons given for raising replacements as indicated by producers were: (1) started pullets were not always available in the immediate vicinity, and (2) difficulties in transporting started pullets resulted in a high mortality during the period immediately following transit.

There are several advantages associated with each method of replacement. Oklahoma poultry producers gave the following advantages in raising replacements: (1) provided an outlet for farm or family labor, (2) provided an opportunity to use small building and land space with only a small additional investment in brooding equipment, (3) provided more information about breeding, health, and condition of the pullet, (4) reduced risk of bringing diseases to the poultry farm, (5) production mortality was usually lower, (6) availability of replacements at time desired, and (7) producers received greater returns when replacements were raised.

The advantages given for started pullets were: (1) labor used in other productive operations, (2) egg production capacity expanded, with the labor and capital released, (3) reduced capital investment in buildings and equipment per layer, and (4) no losses due to brooding mortality.

However, poultry producers who purchased started pullet replacements took precautions to locate a supply of replacement and minimized transit problems.

An analysis of the two replacement practices was made using data obtained from the study of 61 Oklahoma commercial poultry producers. Supplemental data were used from experiments conducted by the Department of Poultry Science, Oklahoma State University. Replacement cost where pullets were raised was available from 15 producers. These 15 records were costs for replacing light breeds. Started pullets were generally purchased at 16 weeks, although the purchase of 20-week old pullets was not unknown. All started pullets in this study were 16 weeks old when purchased. Hence, the 16-week period was used in this analysis of cost of raising replacements in order to have comparable costs for comparison. The average cost of brooding 8,661 chicks to 16 weeks was calculated from the 15 farm records. However, all the information necessary for calculating the cost to 22 weeks was not available, therefore, the cost per pullet was estimated from a combination of the data from the Poultry Science Department and the 15 farm records.

The average cost of raising pullets to 16 weeks of age was $1.21 per pullet raised and estimated average cost of raising a pullet to 22 weeks was $1.69 (Table XX). The average size of brood was 577 chicks started. The broods ranged in size from 200 to 2,990 chicks started. The cost of feed at 16 weeks was $.47, slightly above chick cost, and accounted for 38.8 per cent of the total cost. The importance of feed becomes more important after the 16th week (Figure 7).[6] At 22 weeks of age, the feed

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[6]Note: For an estimate of the average cost of brooding a sixteen-week-old pullet in different size broods, see Appendix Table I.

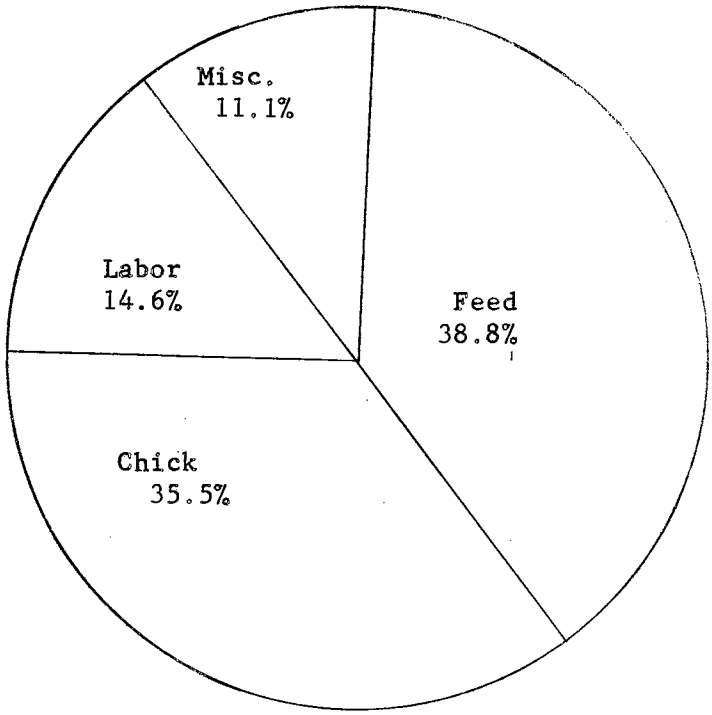

Figure 7: Percentage of Total Replacement Costs, by Items, at 16 Weeks of Age

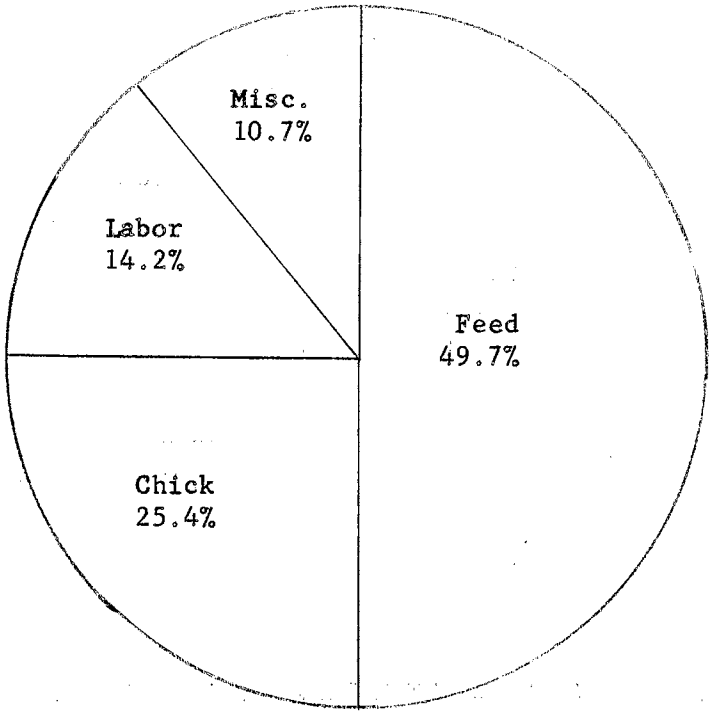

Figure 8: Percentage of Total Replacement Costs, by Items, at 22 Weeks of Age

TABLE XX

COST OF RAISING REPLACEMENTS TO 16 AND 22 WEEKS OF AGE, AS ESTIMATED FROM 15 BROODING RECORDS

Item	Total Cost		Percent of Cost	
	16 Weeks	22 Weeks[d]	16 Weeks	22 Weeks
Feed[a]	.470	.840	38.8	49.7
Chick	.430	.430	35.5	25.4
Litter	.010	.020	0.9	1.2
Fuel	.026	.026	2.2	1.5
Depreciation[b]	.068	.094	5.6	5.6
Medical Supplies	.029	.040	2.4	2.4
Labor[c]	.177	.240	14.6	14.2
Total	1.210	1.690	100.0	100.0

[a]Average amount of feed was 13.5 pounds at 16 weeks and 24 pounds at 22 weeks.

[b]Depreciation includes insurance, taxes, interest, etc.

[c]Labor was valued at $1.00 per hour.

[d]Estimated by extending the farm record data with Department of Poultry Science data for six weeks.

cost was estimated at $.84 per pullet or 49.7 per cent of the total cost (Figure 8). These cost relationships were the results of three interacting forces: (1) certain items of cost were independent of age such as chick cost, (2) feed consumption per chick increased with age,[7] and (3) all feed costs were charged against the birds that lived.

The second largest single item of expense was chick cost. The average price paid was $.43. Chick cost accounted for 35.4 per cent of the total cost at 16 weeks but decreased in importance, representing only 25.4 per cent of the total cost at 22 weeks. It is interesting to note that a $.60 chick increases the cost of a 22-week replacement by $.17

[7]Unpublished data, Poultry Science Department, Oklahoma State University.

from $1.69 to $1.86, slightly less than 10 per cent. Therefore, if the price of the chick is indicative of the quality of pullet and the number of eggs laid, a superior layer would be the best use of resources. An additional dozen of eggs produced by the superior layer at 17 cents would cover the added cost.

Labor was the third most important single item of cost accounting for 14.6 per cent and 14.2 per cent of the total cost at the two ages, respectively. Labor costs were calculated at a rate of $1.00 per hour. The actual labor cost was $.177 at 16 weeks and $.24 per pullet raised at 22 weeks of age. Labor cost per pullet declined as the size of brood increased (Table XXI). More efficient utilization of labor was the major

TABLE XXI

AVERAGE LABOR COST PER BIRD RAISED, BY SIZE OF BROOD, AS ESTIMATED FROM 15 BROODING RECORDS

Brood Size	Broods Reported	Average Labor Cost
<500	10	.32
500-1000	3	.17
>1000	2	.07

advantage of large size broods. The three items--feed, chicks, and labor--accounted for 88.9 per cent of the total cost at 16 weeks and 89.3 per cent at 22 weeks of age. The feed cost increased in importance and the chick cost decreased in importance. The remaining 10.7 to 11.1 per cent was accounted for by miscellaneous items such as litter, fuel, overhead, and medical supplies.

The average cost of $1.21 at 16 weeks of age accounted for mortality in that each item of cost was divided by the number of pullets raised to 16 weeks of age. However, the average mortality up to 16 weeks was five per cent. The average mortality percentage did not vary significantly between broods, nor was the mortality rate greater for larger broods.

The average cost per pullet at 16 weeks varied on the fifteen farms from a low of $1.03 to a high of $2.13 per bird. The item that contributed more to variation in cost was labor. Labor varied from a low of $.04 per pullet raised to a high of $.60 per pullet.

To compare the two replacement alternatives, the same age of pullets must be used. The cost at 16 weeks was used, since all commercial poultrymen who purchased started pullets indicated that 16 weeks was the common age. Twenty-six of the 61 commercial poultrymen interviewed who bought started pullets[8] paid, on the average, $1.80 per pullet delivered to the farm. Most of the started pullets were purchased from commercial hatcheries; however, a few producers purchased started pullets from local farmers.

In comparison, the pullets raised cost $.59 per pullet less. This would represent a labor-management return of $.77 per pullet. The labor-management earnings on replacements may determine whether the poultry flock shows a profit or loss during the production season. However, there are other factors, besides the reduced cost of replacement, that influence the decision to purchase replacements. The number and frequency of replacements may not be very close. If small numbers are needed frequently, the purchase of started pullets may be more economical. The

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[8]Pullets had been vaccinated for newcastle, bronchitis and fowl pox.

amount of buildings and equipment available for brooding purposes is equally important. If buildings and equipment are not available, the producer should decide how long he plans to remain in the poultry business. For a new producer, it may be wise to purchase started pullets until this decision can be made.

The third factor which should be considered before making any management decision on the farm is to evaluate other investment alternatives. Even though raising replacements may be a profitable venture, a poultryman may have other opportunities which may return more to labor and management than raising replacements. The resources required to raise replacements for a large laying flock may be used more efficiently by other enterprises. These may be the best use of either the capital or labor. If these other alternatives returned more per unit of resource, farm profits are increased by the practice of purchasing started pullets.

The guiding principle in allocating resources among different uses is the principle of alternative returns. It may be stated as follows: If resources are limited, all possible alternative uses for them should be examined, and each additional portion should be employed where it will yield the greatest returns.[9] This principle applies where resources are limited and can be put to more than one use on the farm. The principle of alternative returns is sometimes also referred to as the principle of opportunity cost. The use of this term arises from the fact that the cost of using a limited resource in one enterprise is the opportunity to put it to some other use in the business that is given up.[10]

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[9]Raymond R. Beneke, Managing the Farm Business, (New York: John Wiley and Sons, Inc., 1955), p. 33.

[10]Ibid.

Summary

There were two common methods of flock replacements used by Oklahoma poultry producers: (1) purchase pullets at 16-20 weeks of age, and (2) purchase day-old chicks and raise replacements. Raising replacements was more common on Oklahoma commercial poultry farms surveyed than purchasing started pullets.

The average cost of producing pullets to 16 weeks of age was $1.21, and it was estimated that the average cost of raising a pullet to 22 weeks of age was $1.69. Feed was the most important single item of cost and increased in importance from 16 to 22 weeks of age. Chick cost was the second most important item. It decreased in importance from 16 to 22 weeks of age. Labor, the third most important item of cost, did not vary significantly in importance from 16 to 22 weeks of age. These three items of cost accounted for 88.9 per cent at 16 weeks and 89.3 per cent of the total cost of raising replacements at 22 weeks of age. Miscellaneous items such as litter, fuel, overhead, etc., accounted for 10.7 per cent at 16 weeks and 11.1 per cent of total cost at 22 weeks. Average mortality was five per cent and did not very significantly between the 15 broods studied, nor was the mortality rate greater for larger broods.

The poultry producers that raised replacements produced a 16-week old pullet cheaper than the average producer could purchase a 16-week old started pullet. Raising replacements returned $.77 to labor and management per pullet raised. It would be $.77 cheaper per pullet to raise replacements than to buy started pullets if labor and management were excluded. However, the individual producer needs to evaluate his own particular situation to determine which alternative allows him to

utilize his resources most efficiently. This decision should be based on his experience in the poultry business, brooding facilities available, number and frequency in which replacements are needed, and the amount of labor available.

CHAPTER V

SUMMARY AND CONCLUSIONS

Commercial poultry producers are without adequate information pertaining to capital requirements, flock replacement costs and alternatives, labor requirements, and other management practices to use as guides for allocating resources to the poultry enterprise or with other enterprises. They endeavor through trial and error to discover the information needed.

The major purpose of this study was to obtain information related to investments, flock replacement costs and alternatives, labor requirements and to discover management practices associated with poultry production at the farm level. The three specific objectives were to: (1) investigate the characteristics of commercial poultry flocks in Oklahoma or farms with 400 or more laying hens, (2) describe and evaluate the various management practices followed, and (3) analyze alternative flock replacement methods. The study was based on data obtained from 61 commercial poultry operators interviewed during the period, September 1, 1958 to July 1, 1959. These producers were selected from counties with different climatic conditions that were believed to affect management practices, type and cost of housing. The flocks were stratified according to number of hens, 400-799, 800-1599, and 1600 or more layers.

The poultry enterprise is an important segment of the agricultural economy of Oklahoma. The value of poultry and eggs ranked sixth among all principle crop and livestock enterprises in 1957. In terms of total eggs produced, Oklahoma ranked twenty-second among the states in 1957.

However, the rate-of-lay in Oklahoma in 1957 was 179 eggs which ranked forty-third in the states. The number of farms reporting poultry has decreased but the size of flocks on the farms reporting poultry is larger. Data indicates the development of a trend toward larger commercial flocks on farms with poultry. Therefore, this study only considered farms with commercial flocks or farms reporting 400 or more layers.

The study of Oklahoma commercial poultry producers indicated that the size of poultry flocks have increased significantly in size from 1956-1958. The average size of flocks surveyed during the period of the study had about doubled since 1956. The availability of farm buildings, labor and operating capital were the major factors influencing producers to increase the size of flocks.

Eggs were produced commercially on farms with two distinct methods of production: cage and floor plan operations. Cage-flock producers sold only market-eggs, however, floor-plan producers sold both market-eggs and hatchery-eggs. The poultry enterprise was classified as using more than 50 per cent of the total resources on 44 per cent of the farms surveyed. However, poultry was classified as a major enterprise on 64 per cent of the farms. This may indicate that the commercial poultry enterprise is no longer a supplementary or complementary enterprise.

The average size of the surveyed farms was 241 acres in which 138 acres were pasture land and 103 acres were crop land. The farms with floor flocks were larger than farms with cage flocks. Very little crop farming was found on cage-flock farms.

The investment in land and buildings was $32,208 per farm or $133 per acre. Although the poultry enterprise was the major enterprise on

64 per cent of the farms, only 14.6 per cent of the total capital on all surveyed farms was allocated to the poultry enterprise. The investment in farm machinery on all farms was $4,485. Floor flocks had a considerably larger investment than cage producers. However, it was concluded that investment in farm machinery was determined by other factors and not related to the poultry enterprise. It is likely that the present capital structure will not continue and that the present situation represents a transition in farm organizations.

The average investment in poultry buildings and equipment was $4,566 per farm or $347 per 100 layers. However, there was a marked difference between cage and floor plan flocks. Layer-housing investment accounted for about 60 per cent of this investment. The amount of floor space provided per layer was an important factor affecting housing cost per 100 birds. A little more than three square feet of floor space per bird was used by the producers interviewed.

Labor was an important resource in commercial egg production. The floor-plan flocks selling market-eggs required more labor per 100 layers per week than did cage or hatchery-egg flocks. This study separated labor into the two categories, (1) production, and (2) processing. Processing eggs required more labor than producing eggs. The operations of cleaning, grading, and packaging eggs required more labor than any other single operation. There were definite indications that labor requirements decreased as the size of flock increased.

Choosing a method of flock replacements which would be the best use of resources is a poultry managerial problem that tends to be perennial. To maintain a given level of output during a specified period of time

requires a well planned replacement program. The Agricultural Marketing Service estimated that 6.2 million chicks were raised for flock replacements in Oklahoma in 1958. There were two common methods of flock replacements used by Oklahoma poultry producers: (1) purchase pullets at 16-20 weeks of age, and (2) purchase day-old chicks and raise replacements. Raising replacements was more common on Oklahoma commercial poultry farms than purchasing started pullets.

The cost of raising 16 week-old pullets was based on data obtained from 15 farm records. For comparative analysis, the cost of raising replacements was based on a 16-week period; however, costs for 22 weeks were estimated by extending the 16-week records on all items of cost except feed and chicks. The projected feed requirement was based on experimental data.

The average cost of raising a 16-week-old pullet was $1.21. The costs ranged on the 15 farm records from $1.03 to $2.13 per pullet raised to 16 weeks. The cost of raising a 22-week-old pullet was estimated to be $1.69. Feed was the most important single item of cost and increased in importance from 16 to 22 weeks of age. The feed price and the pounds of feed consumed was a major source of variation in cost of raising 16 and 22 week-old pullets. Chick cost was the second most important single item. It decreased in importance from 16 to 22 weeks of age. Labor cost, the third most important item varied only .4 percentage points from 16 to 22 weeks of age. However, labor cost varied between flocks from a low of $.04 to a high of $.60 per pullet raised to 16 weeks. These three items of cost accounted for about 90 per cent of the total cost of raising replacements. Miscellaneous items such as fuel, litter, overhead,

medical supplies, etc., accounted for about 10 per cent. Average mortality was 5 per cent and did not vary significantly between the 15 broods studied, nor was the mortality rate greater for larger broods. The average price paid by producers who purchase started pullets was $1.80. No producers purchased pullets older than 16 weeks. Excluding labor and management costs, this study indicated that it would be $.77 cheaper to raise replacements than to purchase started pullets. This is equivalent to a labor-management return of $.77 per chick raised. However, each individual poultry producer needs to evaluate his own particular situation to determine which alternative allows him to utilize his resources more efficiently. The choice of alternatives should be based on his experience in the poultry business, brooding facilities available, number and frequency which replacements are needed and the amount and quality of labor available.

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APPENDICES

APPENDIX TABLE A

AVERAGE NUMBER OF LAYERS ON FARM, RATE-OF-LAY, TOTAL PRODUCTION, PRICE PER DOZEN, GROSS INCOME, UNITED STATES, 1930-58

Year	Average Number of Layers	Rate-of-Lay	Total Production	Price Per Dozen	Gross Income
	1,000	Number	Millions	Cents	$1,000
1930	321,893	121	39,067	23.7	750,603
1931	303,013	127	38,532	17.6	546,072
1932	299,054	121	36,298	14.2	412,335
1933	299,713	118	35,514	13.8	394,315
1934	290,677	118	34,429	17.0	473,561
1935	276,403	122	33,609	23.4	635,834
1936	284,885	121	34,534	21.8	610,509
1937	288,003	130	37,564	21.3	651,582
1938	275,919	135	37,356	20.3	616,528
1939	289,554	134	38,843	17.4	551,093
1940	296,594	134	39,707	18.0	582,391
1941	300,864	139	41,894	23.5	807,599
1942	341,641	142	48,610	30.0	1,196,819
1943	382,987	142	54,547	37.1	1,667,790
1944	395,796	148	58,537	32.5	1,570,877
1945	369,430	152	56,221	37.7	1,751,381
1946	357,592	156	55,962	37.6	1,743,016
1947	345,117	160	55,384	45.3	2,077,719
1948	331,589	166	54,899	47.2	2,145,041
1949	330,699	170	56,154	45.2	2,102,955
1950	339,540	174	58,954	36.3	1,772,571
1951	327,831	177	58,063	47.7	2,297,753
1952	320,491	181	58,068	41.6	2,001,763
1953	312,086	185	57,891	47.7	2,289,079
1954	314,153	188	58,933	36.6	1,795,348
1955	309,104	192	59,496	38.9	1,923,611
1956	310,799	196	61,042	38.7	1,966,168
1957	304,826	198	60,448	35.2	1,768,013
1958	301,340	201	60,681	38.3	1,934,885

Source: Chickens and Eggs, 1925-52, Agricultural Marketing Service, U. S. Department of Agriculture, (Washington, D. C., May, 1953).

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APPENDIX TABLE B

NUMBER OF CHICKENS ON FARMS, AND VALUE, UNITED STATES, JANUARY 1, 1930-59

Year	Number					Total Value
	Hens	Pullets	Other Chickens	Hens and Pullets	All Chickens	
	1,000	1,000	1,000	1,000	1,000	$1,000
1930	167,139	253,312	48,040	420,451	468,491	434,830
1931	158,214	243,562	47,967	401,776	449,743	315,968
1932	156,178	229,648	50,989	385,826	436,815	258,767
1933	154,037	236,706	53,780	390,743	444,523	199,753
1934	146,997	238,344	48,596	385,341	433,937	182,424
1935	138,609	211,798	39,551	350,407	389,958	212,071
1936	136,187	226,432	40,827	362,619	403,446	304,725
1937	130,445	249,309	44,167	379,754	423,921	278,120
1938	137,958	215,006	36,660	352,964	389,624	294,718
1939	134,331	241,810	42,450	376,141	418,591	292,852
1940	139,079	253,576	45,633	392,655	438,288	265,000
1941	141,430	239,885	41,526	381,315	422,841	276,460
1942	150,170	277,741	49,024	427,911	476,935	397,509
1943	170,337	318,622	53,088	488,959	542,047	563,986
1944	174,000	349,587	58,610	523,587	582,197	685,901
1945	172,426	301,454	42,617	473,880	516,497	626,259
1946	150,712	322,108	50,407	472,820	523,227	662,734
1947	150,490	280,956	35,771	431,446	467,217	672,690
1948	139,587	277,983	32,074	417,570	449,644	648,293
1949	141,044	258,336	31,496	399,380	430,876	716,344
1950	137,014	286,759	32,776	423,773	456,549	622,994
1951	141,178	258,160	31,650	399,338	430,988	627,400
1952	135,814	261,420	29,321	397,234	426,555	652,940
1953	135,411	237,602	25,145	373,013	398,158	561,667
1954	175,840	255,130	25,806	370,970	396,776	569,237
1955	111,376	257,219	22,113	368,595	390,708	410,741
1956	121,719	238,579	22,548	360,298	382,846	481,265
1957	119,833	251,585	21,393	371,418	392,811	459,732
1958	127,891	224,619	18,374	352,510	370,884	467,881
1959	119,565	243,829	19,863	363,394	383,257	481,852

Source: Farm Production, Disposition and Income from Chickens and Eggs, 1909-44, Agricultural Marketing Service, U. S. Department of Agriculture, (Washington, D. C., July, 1953).

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APPENDIX TABLE C

AVERAGE NUMBER OF LAYERS ON FARM, RATE-OF-LAY, TOTAL PRODUCTION, PRICE PER DOZEN, AND GROSS INCOME, OKLAHOMA, 1930-1958

Year	Average Number of Layers	Rate-of-Lay	Total Egg Production	Price Per Dozen	Gross Income
	1,000	Number	Millions	Cents	$1,000
1930	9,587	112	1,071	19.6	16,824
1931	8,547	123	1,054	13.0	11,039
1932	8,687	118	1,021	9.7	7,970
1933	9,595	104	994	10.3	8,257
1934	8,884	99	887	13.6	9,758
1935	7,348	115	842	20.1	13,719
1936	7,327	108	790	18.3	11,712
1937	7,076	124	877	17.6	12,598
1938	7,299	129	944	15.7	12,128
1939	7,732	127	983	13.7	11,006
1940	7,875	125	983	14.3	11,535
1941	8,371	132	1,103	20.6	18,660
1942	9,985	135	1,349	27.5	30,594
1943	11,248	134	1,510	34.0	42,359
1944	11,540	142	1,642	30.0	40,725
1945	10,137	144	1,460	33.2	40.033
1946	9,224	143	1,315	33.3	36,213
1947	8,767	148	1,297	39.7	42,644
1948	8,397	153	1,286	40.6	43,272
1949	7,927	153	1,211	39.9	40,033
1950	8,358	155	1,294	31.0	33,299
1951	6,631	161	1,066	40.7	36,054
1952	5,993	166	994	34.6	28,573
1953	5,153	171	880	41.5	30,364
1954	4,986	167	831	31.7	21,899
1955	4,707	176	829	32.6	22,494
1956	4,809	175	840	33.3	23,255
1957	4,681	177	829	29.3	20,217
1958	4,289	179	767	32.8	20,910

Source: Chickens and Eggs, 1925-44, Bureau of Agricultural Economics, U. S. Department of Agriculture, (Washington, D. C., May, 1953).

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APPENDIX TABLE D

NUMBER OF CHICKENS ON FARMS, AND VALUE, OKLAHOMA, JANUARY 1, 1930-1959

Year	Hens	Pullets	Other Chickens	Total Hens and Pullets	All Chickens	Total Value
	1,000	1,000	1,000	1,000	1,000	$1,000
1930	5,280	8,110	1,350	13.390	14,740	11,005
1931	4,960	7,300	1,280	12,260	13,540	7,312
1932	5,010	6,860	1,215	11,870	13,085	6,281
1933	5,042	7,386	1,372	12,428	13,800	4,140
1934	4,389	6,424	1,192	10,813	12,005	3,241
1935	3,852	5,445	842	9,297	10,139	3,853
1936	3,582	6,044	884	9,626	10,510	5,991
1937	3,331	6,346	937	9,677	10,614	4,458
1938	3,731	5,711	890	9,442	10,332	5,579
1939	3,806	6,625	1,024	10,431	11,455	5,728
1940	4,079	7,023	1,111	11,102	12,213	4,885
1941	4,201	6,040	967	10,241	11,208	5,268
1942	4,453	7,852	1,112	12,305	13,417	8,989
1943	5,566	9,030	1,245	14,596	15,841	13,940
1944	5,455	9,572	1,220	15,027	16,247	16,247
1945	5,564	7,179	1,000	12,743	13,743	14,568
1946	4,674	7,682	1,000	12,356	13,356	14,692
1947	4,300	5,762	650	10,062	10,712	12,426
1948	4,128	5,762	520	9,890	10,410	12,076
1949	4,045	4,898	364	8,943	9,307	12,192
1950	3,802	5,633	346	9,435	9,781	9,879
1951	3,726	4,337	284	8,063	8,347	9,192
1952	3,242	4,207	230	7,449	7,679	9,215
1953	3,015	3,239	200	6,254	6,454	6,454
1954	2,563	3,239	204	5,802	6,006	6,306
1955	2,281	3,271	184	5,552	5,736	4,302
1956	2,646	2,748	177	5,394	5,571	5,014
1957	2,540	3,160	150	5,700	5,850	4,972
1958	2,642	2,370	154	5,012	5,166	4,649
1959	2,510	2,749	169	5,259	5,428	5,102

Source: Farm Production, Disposition and Income from Chickens and Eggs, 1909-44, Agricultural Marketing Service, U. S. Department of Agriculture, (Washington, D. C., July, 1953).

Farm Production, Disposition and Income from Chickens and Eggs, 1940-54, Agricultural Marketing Service, U. S. Department of Agriculture, (Washington, D. C., June, 1956).

Farm Production, Disposition and Income from Chickens and Eggs, 1955-59, Agricultural Marketing Service, U. S. Department of Agriculture, (Washington, D. C., Annual Reports).

APPENDIX TABLE E

CHICKENS: 4 MONTHS OLD OR OLDER ON FARMS REPORTING IN OKLAHOMA AND PERCENTAGE CHANGE, BY STATE AND ECONOMIC AREA

State and Economic Areas	1945[1] All Farms Reporting Poultry	1945[1] Number of Chickens 4 Months or over	1945[1] Hens/farm	1945[1] Percent Change	1950 All Farms Reporting Poultry	1950 Number of Chickens 4 Months or over	1950 Hens/farm	1950 Percent Change	1954 All Farms Reporting Poultry	1954 Number of Chickens 4 Months or over	1954 Hens/farm
State	149,885	11,607,010	77.4	-35.60	121,201	7,474,349	61.7	-21.34	91,764	5,879,480	64.1
Area 1	12,230	1,326,262	108.4	-41.93	9,959	770,104	77.3	-14.79	7,929	656,170	82.8
Area 2	16,793	1,884,026	112.2	-33.67	14,392	1,249,636	86.8	- 7.56	11,865	1,161,806	97.9
Area 3&a	16,375	1,205,165	73.6	-31.47	12,330	825,899	66.7	-23.55	9,202	631,369	68.6
Area 4	22,498	2,111,458	93.9	-41.60	18,184	1,232,274	67.8	-28.38	13,433	882,509	65.7
Area 5&b	21,679	1,643,026	75.8	-36.45	15,764	1,044,113	66.2	-17.16	12,231	864,940	70.7
Area 6	12,141	729,797	60.1	-37.67	9,487	454,850	47.9	-26.35	6,654	335,011	50.3
Area 7a	8,522	538,199	69.0	-36.28	6,804	374,800	55.1	-31.58	5,246	256,426	48.9
Area 7b	6,020	349,887	58.1	-34.56	4,932	228,940	46.4	-29.18	3,453	162,142	47.0
Area 8a	14,096	769,453	54.6	-31.06	11,243	530,488	47.2	-26.65	8,171	389,094	47.6
Area 8b	6,172	343,155	55.6	-24.75	5,797	258,241	44.5	-32.50	4,365	174,305	39.9
Area 9	13,359	656,582	49.1	-23.09	12,259	505,004	41.2	-27.58	9,215	365,708	39.7

Source: United States Census of Agriculture: 1945, 1950, 1954, U. S. Department of Commerce, Vol. 1, Part 25, Oklahoma, Economic Area, Table 3, pp. 190 - 201 (1950 and 1954).

[1]Data of economic areas for 1945 was obtained by a summation of County Data.

APPENDIX TABLE F

FARMS REPORTING EGGS SOLD IN OKLAHOMA AND PERCENTAGE CHANGE, BY STATE AND ECONOMIC AREAS

State and Economic Areas	1945[1]				1950				1954		
	Total All Farms	Dozen[2]	Dozen/farm	Percent Change	Total All Farms	Dozen	Dozen/farm	Percent Change	Total All Farms	Dozen	Dozen/farm
State	144,462	89,219,188	617.6	-59.45	73,927	36,182,753	489.4	-30.69	42,557	25,079,066	589.3
Area 1	11,880	10,660,816	897.4	-57.72	7,777	4,507,202	579.6	-36.52	5,002	2,861,273	572.0
Area 2	16,194	15,549,551	960.2	-42.66	11,555	8,916,215	771.6	-30.24	7,905	6,219,796	786.8
Area 3&a	15,875	8,952,270	563.9	-54.77	7,429	4,049,263	545.1	-27.27	4,294	2,944,913	685.8
Area 4	21,576	16,422,964	761.2	-63.46	12,478	6,001,448	481.0	-41.32	7,171	3,521,784	491.1
Area 5&b	20,785	13,052,548	628.0	-59.58	9,896	5,275,295	533.1	-15.75	6,212	4,444,247	715.4
Area 6	11,728	5,692,004	485.3	-75.60	4,805	1,388,275	288.9	-24.01	2,255	1,054,886	467.8
Area 7a	8,230	4,531,156	550.6	-70.36	3,781	1,342,833	355.2	-32.47	2,157	906,842	420.4
Area 7b	5,857	2,443,627	417.2	-71.25	2,577	702,661	272.7	-28.70	1,189	500,978	421.3
Area 8a	13,738	5,063,615	368.6	-65.19	5,230	1,762,738	337.0	-29.83	2,571	1,236,921	481.1
Area 8b	5,861	2,470,873	421.6	-59.82	2,885	992,790	344.1	-49.26	1,413	503,721	356.5
Area 9	12,738	4,379,764	343.8	70.00	5,514	1,314,030	238.3	-32.75	2,388	883,705	370.1

Source: United States Census of Agriculture: 1945, 1950, 1954, U. S. Department of Commerce, Vol. 1, Part 25, Oklahoma, Economic Area Table 3 (pp. 190-201).

[1]Data of economic areas for 1945 was obtained by a summation of County Data.

[2]Based on eggs produced on farms for 1945, and eggs sold for 1950-54.

APPENDIX TABLE G

FARMS REPORTING CHICKENS ON FARM AS A PERCENT OF TOTAL FARMS REPORTING AND PERCENTAGE CHANGE, BY STATE AND ECONOMIC AREAS

State and Economic Areas	1945[1]				1950				1954		
	Total All Farms	Total Reporting Chickens	Percent	Percent Change	Total All Farms	Total Reporting Chickens	Percent	Percent Change	Total All Farms	Total Reporting Chickens	Percent
State	164,790	149,885	91.0	-19.14	142,168	121,201	85.2	-24.29	119,270	91,764	76.9
Area 1	13,588	12,230	90.0	-18.57	12,419	9,959	80.2	-20.38	11,050	7,929	71.8
Area 2	18,566	16,793	90.5	-14.30	17,448	14,392	82.5	-17.56	15,584	11,865	76.1
Area 3&a	18,192	16,375	90.0	-24.40	14,616	12,380	84.7	-25.67	12,083	9,202	76.2
Area 4	25,125	22,498	89.5	-19.18	21,875	18,184	83.1	-26.13	18,416	13,433	72.9
Area 5&b	23,835	21,679	91.0	-27.28	18,650	15,764	84.5	-22.41	16,170	12,231	75.6
Area 6	13,193	12,141	92.0	-21.86	10,876	9,487	87.2	-29.86	8,417	6,654	79.1
Area 7a	9,177	8,522	92.9	-20.16	7,943	6,804	85.7	-22.90	6,544	5,246	80.2
Area 7b	6,491	6,020	92.7	-18.07	5,405	4,932	91.2	-29.99	4,320	3,453	79.9
Area 8a	15,243	14,096	92.5	-20.24	12,651	11,243	88.9	-27.32	10,218	8,171	80.0
Area 8b	6,952	6,172	88.8	- 6.08	6,653	5,797	87.1	-24.70	5,367	4,365	81.3
Area 9	14,428	13,359	92.6	- 8.23	13,632	12,259	89.9	-24.83	11,101	9,215	83.0

Source: United States Census of Agriculture: 1945, 1950, 1954, U. S. Department of Commerce, Vol. 1, Part 25, Oklahoma, Economic Area Table Number 1, pp. 166-177 and Economic Area Table Number 3, pp. 190-201, (1950-1954).

[1]Data of economic areas for 1945 was obtained by a summation of County Data.

APPENDIX TABLE H[1]

ESTIMATED AVERAGE COST OF RAISING A SIXTEEN WEEK-OLD PULLET, BASED ON NUMBER OF CHICKS STARTED

Number of Chicks Started	Average Cost Per Pullet Raised to 16 Weeks
200	$1.73
400	1.36
600	1.23
800	1.17
1000	1.13
1200	1.11
1400	1.09
1600	1.08
1800	1.06
2000	1.06
2200	1.05
2400	1.05
2600	1.04
2800	1.03

[1]Estimated from regression analysis using data obtained from fifteen farm brooding records.

VITA

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Master of Science

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