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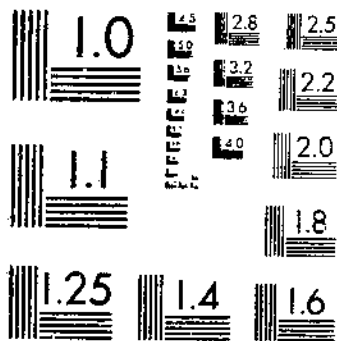
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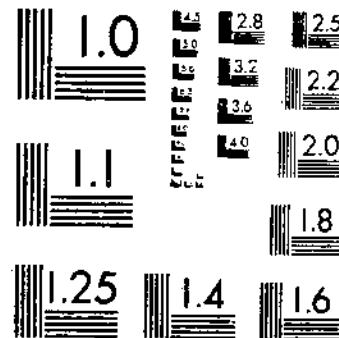
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ECONOMIC CHOICES IN BROILER PRODUCTION
HANSEN, P. L. * MIGHELL, R. L. * 1 OF 1

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Economic Choices

in BROILER PRODUCTION

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HIGHLIGHTS

The great expansion in production of commercial broilers is one of the outstanding phenomena of recent agricultural history.

Production problems of broiler producers, like production problems that confront other types of farmers, involve economic choices. But the short life cycle and technical limitations in broiler production impose special conditions.

Broilers reach market weight in a few weeks. Because of this, several lots can be raised with the same fixed resources in the course of a calendar year.

Programming of alternative choices involves consideration of the economic choices open to producers in view of the physical and biological limitations of the different systems of operation.

The most profitable market weight for broilers is interrelated with the number of birds per lot and the number of lots per year possible within time, space, and labor limitations.

The most profitable market weight for broilers in intermittent lot production is higher than in continuous production. The most prof-

itable weight in continuous production tends to be lower for producers with space limitations than for producers with labor limitations.

Under some circumstances, the fact that cockerels grow more rapidly and also make more economical gains than pullets becomes significant and may affect the initial choice of sex of chicks. Usually, production of mixed or straight-run chicks is more profitable than production of cockerels and pullets in separate lots.

The key business firm in the broiler industry appears to be the feed-dealer supplier. Although some growers operate independently, the usual contractual situation in most commercial producing areas is one in which the feed dealer supplies feed, chicks, and other materials and makes most of the business decisions. Growers retain some of the attributes of independent operators, but the main decisions are made by the feed dealers.

Programming procedures similar to those used by producers can be used by feed dealers to help determine the most profitable production choices.

Economic Choices in BROILER PRODUCTION¹

By Peter L. Hansen, and Ronald L. Mighell, Agricultural Economists, Production Economics Research Branch, Agricultural Research Service, United States Department of Agriculture

INTRODUCTION

The expansion that has taken place in production of commercial broilers in the United States during the last 20 years is one of the more amazing episodes in the history of livestock production. This has been noted on several occasions (3, 4).² From a relatively low level in 1934, the first year for which an official estimate of broiler production is available, the total output rose to more than a billion broilers in 1954. Increases in the annual level of output have taken place in each year since 1934, except 1944 and 1946 when small decreases occurred.

Chicken meat was formerly a byproduct of egg production. It consisted of hens culled from laying flocks and of cockerels from replacement flocks. The substantial annual production of chicken meat from these sources was not exceeded by that from commercial broilers until 1951 (fig. 1).

Before the expansion in broiler production, a number of advances in animal genetics, nutrition, and disease control had resulted from years of research. These advances brought about economies in production, in marketing, and in transportation, and were responsible for the rapid growth of broiler production. They constituted a broad technological advance so intermeshed that each innovation would not have been fully effective without the others. The broiler industry was in a unique position to take advantage of these improvements, many of which strengthened the competitive position of poultry more than that of other livestock.

The production of broilers has developed on a commercial scale in concentrated areas. One of the earliest and best known is the so-called Delmarva area on the peninsula that includes most of Delaware and the parts of Maryland and Virginia on the Eastern Shore of Chesapeake Bay. Recently, the largest production in an individual State has been in Georgia. Concentrated areas of output are located also in Arkansas, Texas, Alabama, North Carolina, and Indiana, on the Pacific Coast, and in New England (fig. 2). Most of the nearly black areas on the dot map are leading broiler areas, and the more

¹ Submitted for publication May 28, 1956.

² Italic numbers in parentheses refer to Literature Cited, p. 26.

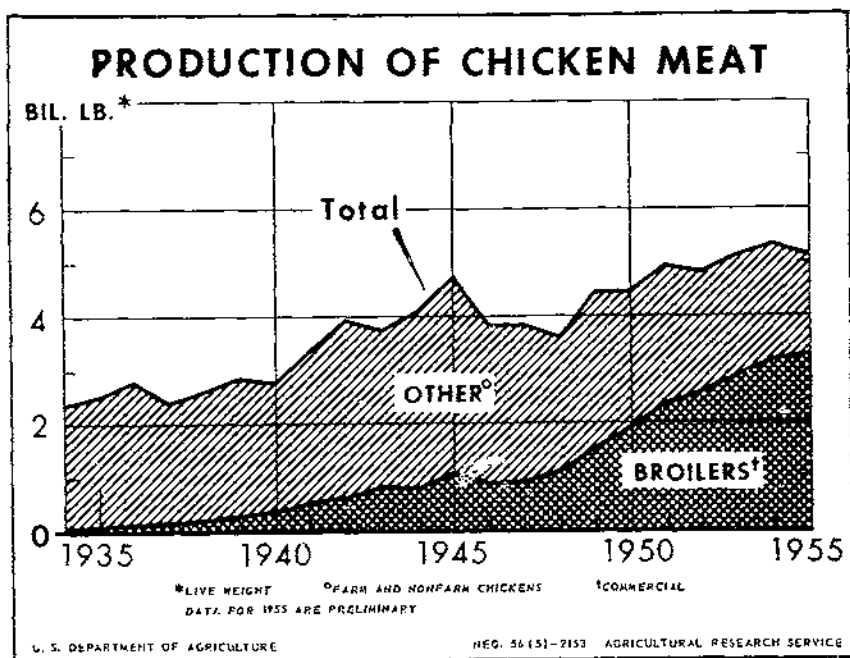


Figure 1.—Since 1951, commercial broilers have made up more than half the total production of chicken meat.

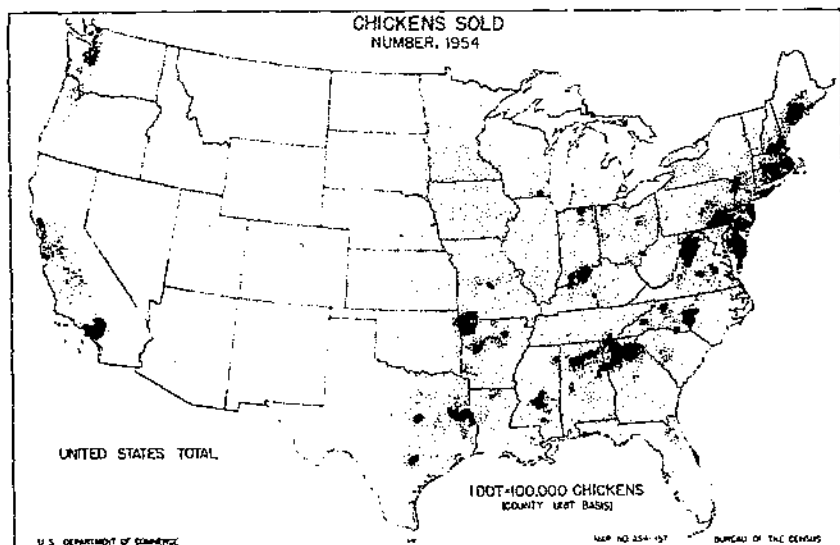


Figure 2.—Chickens are sold in all regions. Areas of concentrated sales usually are centers of commercial broiler production.

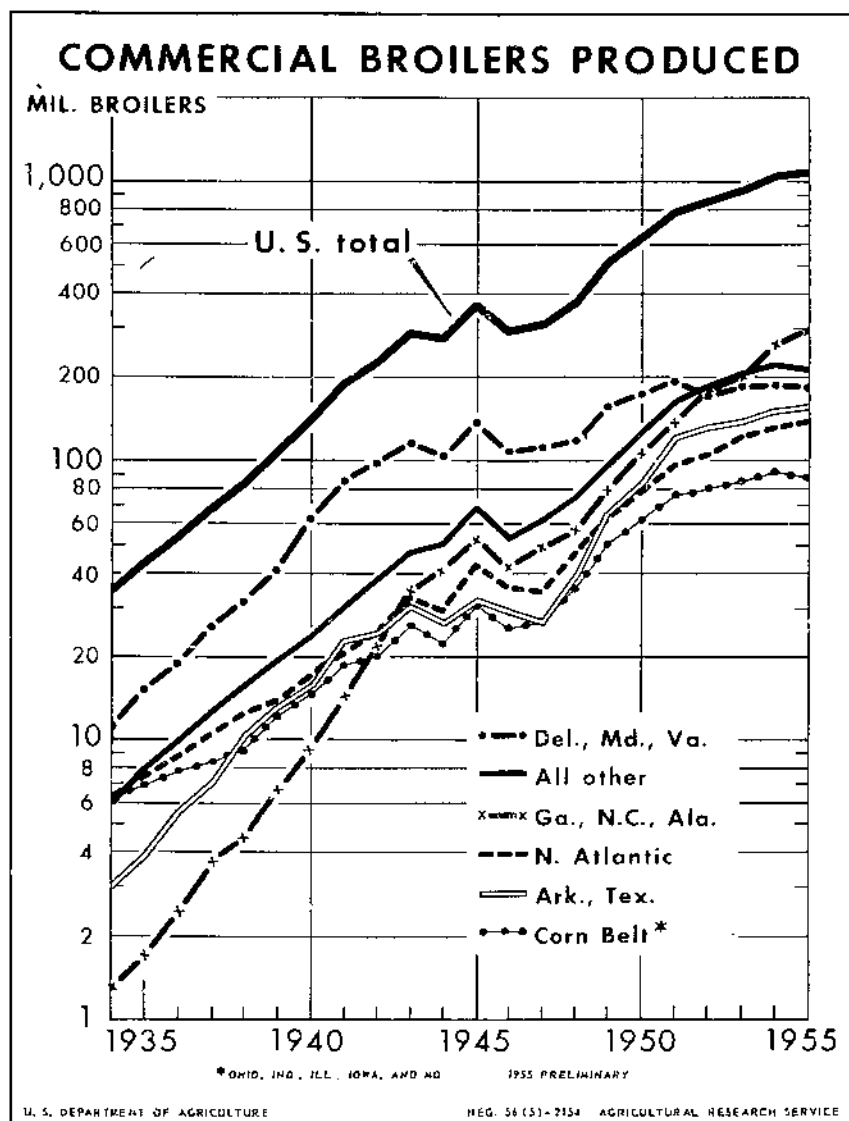


Figure 3.—A similar pattern of rapid expansion is found in all the specialized broiler areas.

general scatter represents mainly the sales of farm chickens. Trends in broiler production by areas are similar (fig. 3).

Commercial broiler production is a highly specialized farm enterprise that is frequently large-scale. Development of commercial broiler production in some areas was aided by nearness of the areas to consuming centers. Lack of other profitable alternatives for the available supply of labor was frequently a factor. With the passage of time, supporting industries, such as hatcheries, feed mills, feed dealers, processing plants, and other related concerns have become

established and have strengthened the competitive position of these areas.

Commercial broiler producers and their financial sponsors are businessmen who are faced with many economic choices in planning and carrying on their commercial enterprises. This bulletin is intended to bring together information from technical studies of input-output relationships in broiler feeding and management, and to focus attention on the use of these data and relationships in approaching economic choices in the production problems that confront broiler producers, dealers, and financiers.

PRODUCTION PROBLEMS AND ECONOMIC CHOICES

Like other farmers and producers, a broiler producer wants to operate his business in the way that will yield the largest net return for his labor and fixed resources (6, 15). His first problem in achieving this goal is to select a system of production based on an efficient combination of his resources. Because the resources available to each producer differ, net returns vary widely. Uncertainties as to prices at selling time, accidents of disease, and vagaries of weather may prevent a grower from receiving the highest return. Once initial decisions have been made and some of the resources have been committed, the economic problem narrows to that of maximizing net returns for the system of production chosen.

In broiler production, as in other production, it is desirable to distinguish between costs of fixed and variable resources. Fixed costs include those for buildings, equipment, land, labor, management, and even chicks once they have been purchased. These costs are characterized by the fact that they do not vary within a given production cycle. Variable costs consist mainly of feed, the major item that varies with the length of time the broilers are kept. The changing relationship between inputs of feed and output of meat is important in maximizing the returns to the producer. The relative prices of feed and broilers determine the point on the diminishing-returns curve to which it pays to feed.

It should be recognized that the investment in fixed resources in broiler production is relatively less than in most types of farming. This is illustrated in table 1 in which capital charges for several selected types of farming are expressed as percentages of the total of capital charges and cost expenditures. The computations show that capital charges for broiler production in 4 areas are between 1 and 3 percent. For the other selected types of farms, the range is from 20 to 42 percent. As someone has said, a 3-pound broiler is little more than an animated 8 to 10 pounds of feed.

The fixed charges carried along from one lot to the next are minor. Nevertheless, the initial provisions for construction of houses and purchase of essential equipment may affect expansion significantly in new areas or may influence adjustments in older producing areas. A 1953 study in Mississippi, for example, shows an average new replacement cost of houses and fixed equipment of \$490 per 1,000-bird capacity (16). Estimates of the initial cost for housing and equipment in Connecticut, where investment costs are higher than in Mississippi, indicate \$2,145 per 1,000-bird capacity (10). These estimates were made

independently by different investigators, and they may not be entirely comparable. However, they will serve to illustrate the point. Milder climate, lower cost of materials, and greater availability of labor contribute to the lower costs in Mississippi. A part of the difference may also come from willingness to get along with less convenient housing and equipment.

TABLE 1.—*Capital charges as a percentage of the total of capital charges plus cash expenditures, selected types of farms and areas*

Type of farm and location	Year	Capital charges as a percentage of total costs ¹
		Percent
Cattle ranches, Intermountain region (5)-----	1954	42
Cash-grain, Corn Belt (5)-----	1954	37
Dairy, Central Northeast (5)-----	1954	20
Hog-beef raising, Corn Belt (5)-----	1954	31
Broilers:		
Eastern Shore (17)-----	1947-48	2
Shenandoah Valley (17)-----	1947-48	3
Connecticut (10)-----	1952	3
Mississippi (16)-----	1953	1

¹ Total costs here consist of charges on capital investment plus cash expenditures but do not include the value of labor of the operator and his family. Percentages, which are computed from data in publications noted, are only approximate because of some differences in accounting methods.

In order to maximize net returns, a number of economic choices based on knowledge of technical and physical production relationships must be made. The choices involve both direct and opportunity costs. A more efficient use of resources temporarily may not bring as large ultimate net returns as some other choice. The largest net return on an individual lot of broilers may reduce the net returns for the year as a whole if it reduces the number of lots that can be produced during the year.

The choice of the length of the feeding period is related to the marketing weight of the broilers and the number of lots produced annually. The choice of marketing weight also affects the number of broilers produced per lot. Small broilers need less space than large ones.

TECHNICAL LIMITATIONS ON CHOICES

The Broiler

The primary limitation in broiler production is the broiler itself, its characteristic size, life cycle, feed consumption, and rate of growth, and the limits within which each of these characteristics can be modified.³ An understanding of the possible economic choices is based on knowledge of these physical and biological considerations.

³ Commercial broilers are officially defined as young chickens of both sexes of the heavy breeds to be marketed at from 2 to 5 pounds' live weight.

First, the growth curve for broilers, like the growth curves for most other meat-producing animals, has a forward-leaning, elongated S-shape (fig. 4). The growth curves in figure 4 are from several sources. Three from recent studies (1, 2, 10) are much alike and they run close together. The fourth curve, from an older study by Jull and Titus (11), shows the slower rate of growth that was typical in the early days of the industry.

The Jull-Titus study, which was one of the earliest experiments undertaken for the specific purpose of learning about input-output relationships in growing chickens, was carried out at Beltsville in

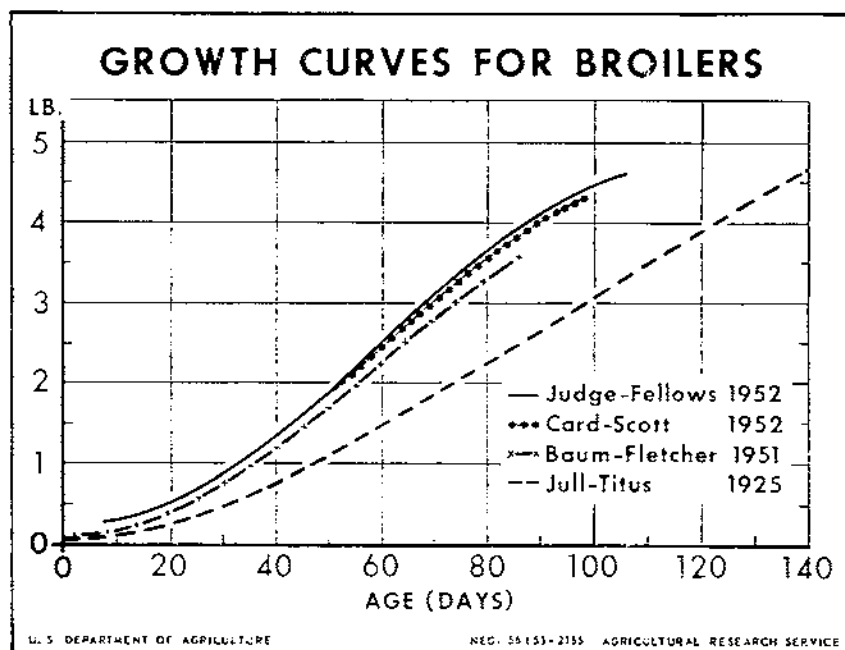


Figure 4.—Growth curves for commercial broilers of current types are much alike; those that were typical 30 years ago represented slower rates of growth.

1925. The experiment was set up to test the application of the principle of diminishing increments. A comparison of the input-output results of the Jull-Titus study with results from recent experiments may serve as a rough measure of the improvement that has taken place during the last 30 years in the efficiency of producing broilers.

The Jull-Titus experiment used 170 chicks from a cross of Rhode Island Reds and Barred Plymouth Rocks. The data include information on weight of chicks by sex, and quantity of feed consumed per bird, by 2-week periods, up to 24 weeks of age. It took about 13.5 weeks for the average broiler to reach a weight of 3 pounds; and total average consumption of feed was 10.4 pounds.

An experiment conducted by Card and Scott (2) at the University of Illinois in 1952 used 50 caged chicks of each sex from a cross of New Hampshires and Barred Plymouth Rocks. The experiment was designed to obtain data on weekly consumption of feed and gains

beyond the age at which broilers are customarily marketed. Data of this kind are seldom available from commercial producers for more than the first 10 or 12 weeks. Data were kept separately by sex. Records were discontinued at 15 weeks for pullets and at 18 weeks for cockerels. For a weight of 3 pounds, the birds consumed an average of 8.0 pounds of feed. This was 23 percent less than was used in the Jull-Titus experiments in 1925 (11). Moreover, the 3-pound weight was reached more than 3 weeks earlier.

The rapid growth of the birds in the Illinois experiment is not exceptional. Almost identical results were noted in 1952 in experiments with heavy breeds at Connecticut (10). The data from Connecticut shows weekly gains and consumption of feed up to 15 weeks of age.

In Washington State, Baum and Fletcher (1) obtained input-output data from records of selected broiler growers in 1951. These data were not from controlled experimental work, but broilers that averaged 3 pounds were produced in 73 days with as little as 8.4 pounds of feed.

Figure 5 compares input-output relationships as observed by Jull and Titus in 1925 and by Card and Scott in 1952. The 1952 curve is steeper than the 1925 curve as a result of the reduction in the quantity of feed needed for each unit of gain. Each curve probably represents an efficiency in use of feed that is somewhat above the level reached by the average broiler producer for that year, but the difference between the two curves may be a measure of the improvement for the period. The main reason for increased efficiency in use of feed in 1952, as compared with 1925, is the more rapid growth of the broilers. Chickens have a relatively high metabolic rate, and this makes the cost of feed for body maintenance high (22, pp. 45-49). Large savings in the quantity of feed used for maintenance have been made possible by genetic, nutritional, and other advances that result in reducing the length of time a chick needs to reach a given weight. It took about 3.5 weeks less time to produce a 3-pound broiler in 1952 than it did in 1925.⁴

Production of commercial broilers was just beginning in 1925. Growers' practices may have lagged behind experimental results more than in 1952. Today, broiler producers probably adopt improvements more rapidly than almost any other type of farmer. This is supported by reports on progress in the efficient production of broilers. Based on information from a survey of contestants in the chicken-of-tomorrow contest of 1951, Shrader (19) estimated that two-thirds of the commercial broilers grown in 1950 carried improved bloodlines from chicken-of-tomorrow breeding stock.

Time as a Limitation

Time as a physical limitation is sometimes taken for granted. In agriculture, a single production cycle is commonly all that occurs in a year. Crops are usually planted and harvested once in a calendar year, and livestock production also tends to follow the calendar.

⁴Recent experimental work suggests that nutrition and genetics have contributed about equally to this advance (13).

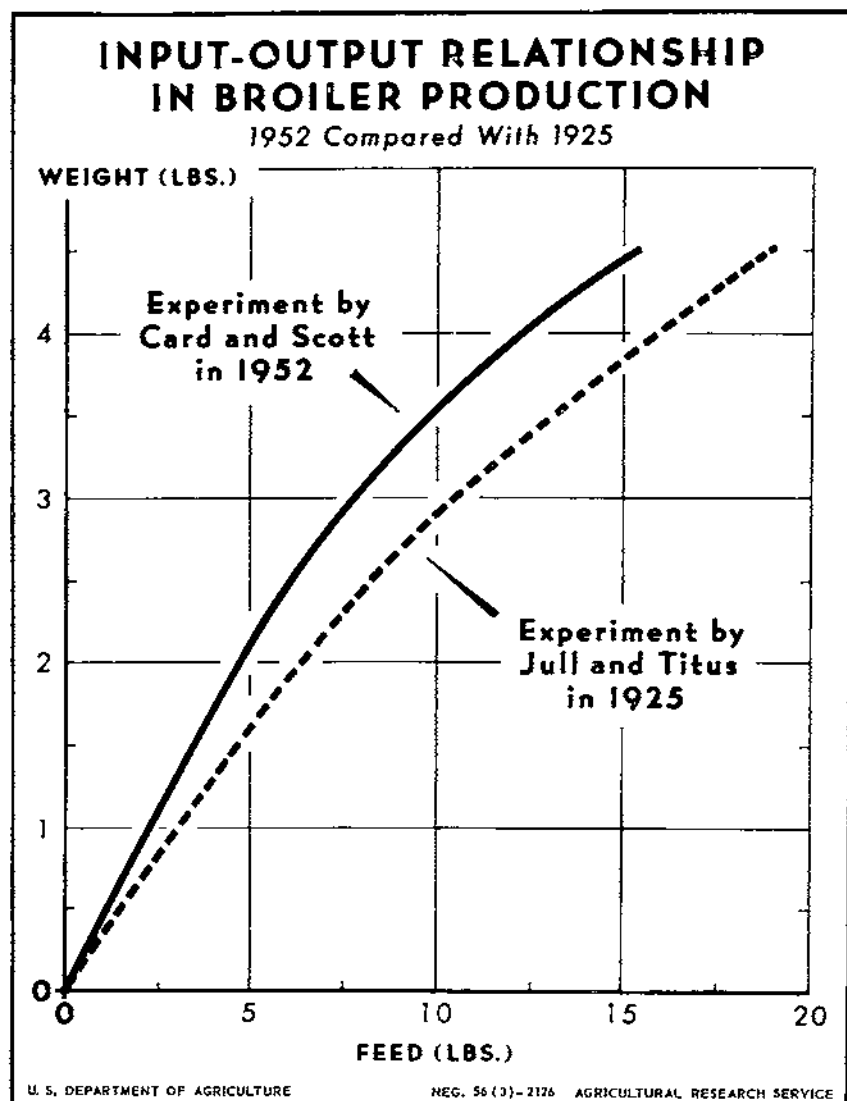


Figure 5.—Changes in input-output relationships in broiler production from 1925 to 1952 reflect advances in breeding, feeding, and management.

Most of agriculture, unlike industry, is bound by the seasons rather than by the daily time clock.

In its timing, production of commercial broilers resembles an industrial operation. The production cycle is relatively short, and specialized growers produce several lots of broilers a year. Operations are more nearly divorced from seasonal influences, and they can be planned to utilize time and other fixed resources more fully.

Flexibility and the possibility of choice with respect to the number of lots produced in a year enter into the problem because broilers may

be marketed at different ages and weights. Assuming that marketable weights for broilers range from 2.25 to 4.25 pounds, at least in different markets, the range in age at marketing would be from 58 to 96 days, according to the Card-Scott data (2). Usually about 2 weeks is allowed between lots for cleaning and disinfecting houses. With 2 weeks added, the total pen time chargeable to each lot ranges from 72 to 110 days. Dividing 365 days by the total chargeable pen time gives 5.1 to 3.3 lots per year as the limits for 2.25- to 4.25-pound broilers. The data for designated groups are as follows:

Market weight (pounds)	Age at marketing, plus 14 days (days)	Lots per year (number)
2.25	72	5.1
2.50	76	4.8
2.75	80	4.6
3.00	84	4.3
3.25	89	4.1
3.50	94	3.9
3.75	99	3.7
4.00	104	3.5
4.25	110	3.3

Within the assumption stated, these are the limits for the number of lots that can be grown in a year. Broilers that grow more slowly would mean fewer lots a year. Or if the 2-week cleanup time were reduced, the number of lots could be increased slightly.

Space as a Limitation

Space is a more definite limitation in broiler production than in other types of livestock production for some of the same reasons that time is a limitation. In production of broilers, as in industrial production, space under the factory roof must be utilized fully if production is to be most efficient. It is true that broilerhouses represent a much smaller capital investment than is found in many industrial enterprises and that frequently additional space could be built. But at any particular time, the available housing space limits the number of birds that can be carried.

Different numbers of birds can be handled in the same space if it is planned to market them at different weights. Heavier birds need more space per bird; therefore, fewer birds can be housed if they are to be held to 4.25 pounds than if they are to be marketed at 2.25 pounds.

Experimental work on space has dealt more with the space needed for birds that weigh about 3 pounds at marketing than with space requirements for birds at other weights. Research at the Delaware Agricultural Experiment Station compared alternative space allocations of 0.5, 0.6, 0.75, and 1 square foot per 3-pound bird (20, 23). A spacing of 0.75 square foot was found to be most desirable under usual farm conditions. Apparently some crowding may be profitable if price conditions are favorable. Under lower prices, somewhat more space per bird may be more profitable.

Crowding tends to increase mortality and results in more uneven gains. The result is greater variation in the weight of individual broilers at the same age. In summer, more space per bird may be

needed because of periods of hot weather. Space allowances up to 1 square foot per bird are common. But with proper management and adequate equipment for ventilation, it may not be necessary to increase floor space in summer (21). Less efficient growers and those with less adequate equipment may need to allow more space.

Space needed per bird at different marketing weight levels may be assumed to be proportional to the differences in weight. The following space estimates are used in this bulletin, beginning with 0.5 square foot for a weight per bird of 2.25 pounds and rising by 0.07 square foot for each additional 0.25 pound of weight.

Market weight (pounds)	Space per bird (square feet)	Broilers produced per 5,000 square feet (number)
2.25	0.50	10,000
2.50	.57	8,772
2.75	.64	7,812
3.00	.71	7,042
3.25	.78	6,410
3.50	.85	5,882
3.75	.92	5,435
4.00	.99	5,050
4.25	1.06	4,717

Labor as a Limitation

Much of the labor used in broiler production is that of the operator and his family. Even in the intensive Delmarva area, McAllister and Bausman (14) reported in a 1950 study that 63 percent of all labor used in producing broilers was operator and family labor.

On some farms, the broiler enterprise is a sideline that uses available labor at seasons when other work is not pressing. Such farms may produce only 1 or 2 lots a year. Large specialized producers may hire labor on an annual basis. For these producers, hired labor must be treated as a fixed cost.

The number of broilers that one man can care for varies with the housing and facilities available. Individual brooder stoves or central heating, hand or automatic feeding and watering, and other variations affect the number. The experience and skill of the worker are also important. Some workers are able to handle only a few thousand birds. Others with more adequate facilities may care for 20,000 or more.

The limiting factor under most setups probably is the number of chicks that a man can oversee during the brooding period, when the chicks are very small. This is a critical period, and mortality may rise sharply if anything goes wrong.

Long-range plans should be made in terms of adjusting other resources, including housing and equipment, to the available and expected labor supply, particularly that of the operator and his family. This is the resource that is most fixed, and it is the one for which it is desired to maximize returns. It is not always possible to work out this arrangement, however, and many practical situations arise in which the available labor has more or less housing, equipment, or other resources, than represents the best long-range combination.

PROGRAMMING ALTERNATIVE PRODUCTION CHOICES⁵

Two significant classes of input-output relationships in feeding livestock may be recognized: (1) Those associated with the growth of the animal and resulting in products like meat; and (2) those related to the output of animal products from the mature animal that are more or less continuous flows, like milk or eggs. The phenomenon of diminishing physical outputs is involved in both classes of relationships and influences economic choices.⁶

The economic choices open to a broiler grower depend (1) on the physical and biological relationships discussed earlier and (2) on how these relationships affect his individual situation. He may have limitations with respect to capital equipment, labor, or other resources. He may be an independent operator, or he may operate under a contract with a feed dealer or a broiler financier. He may be an occasional sideline grower or he may be a specialized producer. These and many other circumstances may circumscribe or restrict his range of choices.

In the discussion that follows, three operating situations are considered. These are: (1) The intermittent single lot; (2) continuous production with labor limited; and (3) continuous production with space limited. Implicit assumptions at this stage in our analysis are that the operator is independent, and that each situation with its limitations is fixed for at least a year. Modifications are necessary for situations of lesser independence and for different time periods.

The three situations are not alternatives for each other within the same time period. Each is a separate operating system in which some growers find themselves, and the alternative choices open to them lie only within each system considered by itself.

The single-lot system is typically a sideline enterprise carried on in conjunction with other farm enterprises in a general farm business. The other two systems represent situations for specialized commercial growers who operate continuously and who frequently have little farm business other than the broiler enterprise.

The Intermittent Single Lot

A grower who produces only a single lot of broilers is usually concerned with a relatively simple problem in trying to maximize his returns. He may have labor or space limitations, but ordinarily the weight to which it pays to feed is determined mainly by the relationship between the cost of feed per pound of broiler and the price that may be obtained. In terms of marginal cost, once he has started the lot, it pays to feed to the point at which the cost of the last unit of gain equals the price obtained for it, unless the competition with some other farm enterprise becomes too great.

Table 2 shows this relationship and indicates how it pays to feed broilers in single lots to higher weights when the prices received are higher. Broilers that are as efficient feed converters as these can

⁵ See also Hansen (6) and Mighell (15).

⁶ Analysis of economic choices in feeding for egg production is presented elsewhere (7).

be profitably carried to a weight of 3.75 pounds when the selling price is 25 cents a pound, feed is \$5 per 100 pounds, and other prices are as assumed. If the selling price increases to 30 cents, the most profitable weight in a single lot goes up to 4.25 pounds in this example. Broiler-feed price ratios of 5 to 1 and 6 to 1 are used in this illustration because the annual average ratio in recent years has been within this range most of the time.⁷ In market areas in which a premium is paid for broilers weighing 4 pounds or more, it may be profitable to feed to higher weights. In areas where broilers of lower weights are in demand, it may not be desirable to feed broilers beyond the weight of general market preference because of the difficulties of selling them.

TABLE 2.—*Costs and returns per 100 broilers marketed at specified weights*

Weight (pounds)	Age	Feed used		Cost of chicks ³	Returns above direct costs, when price per pound is— ⁴	
		Quantity ¹	Cost ²		25 cents	30 cents
	Days	Pounds	Dollars	Dollars	Dollars	Dollars
2.25-----	58	551	27.55	20.81	7.89	19.14
2.50-----	62	633	31.65	20.88	9.97	22.47
2.75-----	66	725	36.25	20.96	11.54	25.29
3.00-----	70	818	40.90	21.02	13.08	28.08
3.25-----	75	911	45.55	21.09	14.61	30.86
3.50-----	80	1,015	50.75	21.13	15.62	33.12
3.75-----	85	1,129	56.45	21.23	16.07	34.82
4.00-----	90	1,263	63.15	21.32	15.53	35.53
4.25-----	96	1,400	70.45	21.38	14.42	35.67
4.50-----	101	1,584	79.20	21.45	11.85	34.35

¹ Includes feed of nonsurviving birds; mortality estimated at one-half of 1 percent a week.

² Price of feed at \$5 per 100 pounds.

³ Includes about 2 cents for fuel and medicine; total estimated at 20 cents per chick started. Because of mortality, the cost of these items per chick marketed rises slightly as weight increases.

⁴ Direct costs include feed, chicks, fuel, and medicine but not labor or fixed costs such as buildings, equipment, interest, taxes, and insurance. Value of manure is assumed to offset cost of litter.

Continuous Production With Labor Limited

Annual returns from broilers under conditions of continuous production with limited labor but with sufficient space are shown in table 3. These estimates are based on an operating unit of 10,000 chicks started per lot. Annual returns above direct cash expenses were com-

⁷ Prices of broilers at slightly lower levels, between 20 and 25 cents have prevailed recently in several important broiler areas. Somewhat lower feed prices have also been associated with these areas. It is possible that future levels of prices may be lower than those assumed, but it is believed that broiler-feed price ratios will tend to fall within about the same range.

puted for the number of broilers that could be produced per year at each weight. The same price assumptions as in table 2 were used.

Table 3 shows that, within the assumptions used, broiler producers who operate continuously by starting a new lot of broilers 2 weeks after the sale of each preceding lot obtain the largest annual return by selling at a weight between 3.25 and 3.5 pounds. With a price of 25 cents, the most profitable weight is closer to 3.25 pounds, and with 30 cents it is about 3.5 pounds. As compared with single-lot operation, the most profitable weight changes less as the price goes from 25 to 30 cents.

TABLE 3.—*Annual production and annual returns above direct costs, broilers marketed at specified weights, continuous production with labor limited*

Weight (pounds)	Age plus 2 weeks	Lots per year ¹	Broilers produced annually ²	Annual returns above direct costs, when price per pound of broilers is— ³	
				25 cents	30 cents
	Days	Number	Number	Dollars	Dollars
2.25	72	5.1	48,887	3,857	9,357
2.50	76	4.8	45,874	4,574	10,308
2.75	80	4.6	43,832	5,058	11,085
3.00	84	4.3	40,850	5,343	11,471
3.25	89	4.1	38,803	5,669	11,975
3.50	94	3.9	36,773	5,744	12,179
3.75	99	3.7	34,754	5,585	12,101
4.00	104	3.5	32,750	5,086	11,636
4.25	110	3.3	30,740	4,433	10,965

¹ Estimated number of lots that could be produced in a year, allowing 2 weeks between lots for cleaning broilerhouse and equipment.

² Based on 10,000 chicks started in each lot; mortality estimated at one-half of 1 percent a week.

³ See footnotes, table 2.

Continuous Production With Space Limited

Annual returns from broilers under conditions of continuous production when space is the limiting factor are shown in table 4, with the same price assumptions as before. The table shows how the various combinations of numbers and market weights work out with a broilerhouse of 5,000 square feet. The most profitable market weight for the two assumed prices lies between 2.25 and 2.5 pounds. The relationship between the two prices is reversed, as compared with the other operating situations, because the lower weight is more profitable at the higher price. This occurs because the difference in the number of broilers that can be produced annually at each weight is now sufficiently great, when multiplied by the larger price margin, to make the lower weight more profitable at the higher price.

TABLE 4.—*Annual production and annual returns above direct costs, broilers marketed at specified weights, continuous production with space limited*

Weight (pounds)	Age plus 2 weeks	Space per bird	Broilers produced per lot ¹	Lots per year	Broilers produced annually	Annual returns above direct costs, when price per pound of broilers is— ²	
						25 cents	30 cents
	Days	Sq. feet	Number	Number	Number	Dollars	Dollars
2.25	72	0.50	10,000	5.1	51,000	4,024	9,761
2.50	76	.57	8,772	4.8	42,106	4,198	9,461
2.75	80	.64	7,812	4.6	35,935	4,147	9,088
3.00	84	.71	7,042	4.3	30,281	3,961	8,503
3.25	89	.78	6,410	4.1	26,281	3,840	8,110
3.50	94	.85	5,882	3.9	22,940	3,583	7,598
3.75	99	.92	5,435	3.7	20,110	3,232	7,002
4.00	104	.99	5,050	3.5	17,675	2,745	6,280
4.25	110	1.06	4,717	3.3	15,566	2,245	5,552

¹ Assumes 5,000 square feet of housing space filled so as to be at capacity at indicated market weight with specified space allowance. For example, with the mortality rate assumed, it is necessary to start 10,432 chicks to produce 10,000 broilers at 2.25 pounds.

² See footnotes, table 2.

Comparisons Between Systems

The difference in the most profitable weight under similar price assumptions for the three operating systems may help to explain some of the regional differences in broiler weights. Southern broilers run a little lighter in weight than most northern-grown broilers. Limited housing space may frequently have been a controlling factor in the South. As pointed out earlier, the cost of additional housing is relatively minor as compared with other costs in broiler production. Consequently, this situation may change quickly. While it continues, however, the limitation on space definitely affects market weights.⁵

Marginal Costs

An alternative way to approach the analysis of the most profitable weight for broilers is the marginal cost analysis shown in figure 6. The three cost curves indicate the marginal costs at each market weight for broilers under each system for the conditions assumed. The most profitable market weight for any market price is the one at which the marginal cost is the same as the market price.

Two points stand out: (1) The most profitable weight (the weight at which the marginal cost equals the price received) is lower for continuous production than for single-lot production and especially when space is limited. (2) The marginal cost changes so sharply that the most profitable selling weight varies only slightly with a change in

⁵ This is not to forget significant regional preferences in taste that affect price and market weights from the demand side.

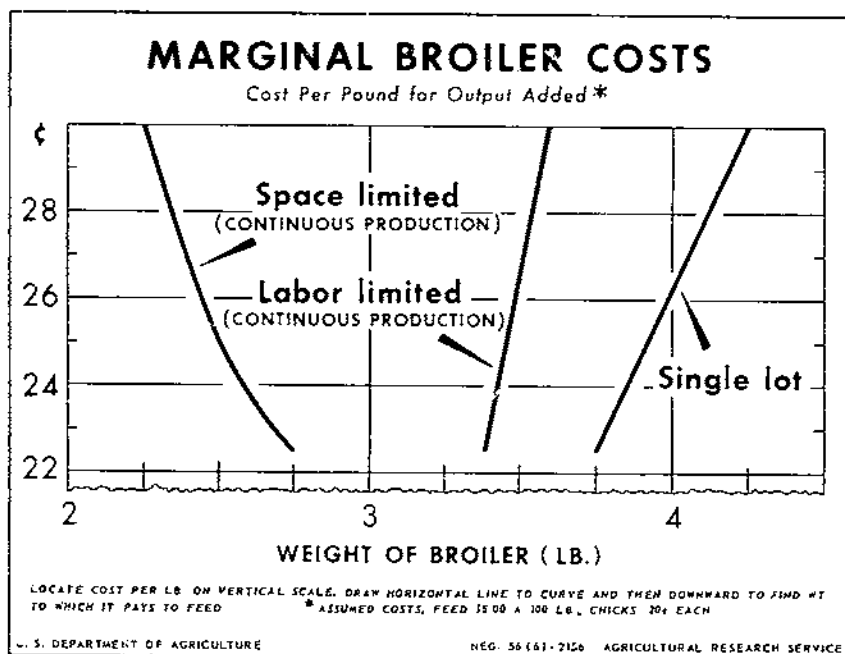


Figure 6.—The market weight at which marginal costs balance market prices per pound varies with price relationships and with systems of operation.

price; and broiler producers find little advantage in changing market weights on an annual basis. If, however, a substantial rise or fall in price were certain within a few weeks, a producer might make a short-range adjustment by holding his broilers for a higher return or selling early to cut losses. He would hope that a greater gain on the current lot would be enough to offset any decreased income from curtailing later operations or that current losses could be recouped later.

The reversed slope of the marginal cost curve for continuous production with space limited, as presented in figure 6, may appear odd at first thought. The explanation lies in the kind of flexibilities available under conditions of limited space. For example, if prices of broilers rise from 25 to 30 cents, the only way in which output can be expanded is by raising more birds to be marketed at lower weights. This increases marginal costs, but total returns rise faster than costs and the shift to lower weights is profitable (table 4).

Premiums and Discounts at Different Weights

The average market weight for commercial broilers in the United States is in the neighborhood of 3 pounds at present, but this varies considerably in different areas. Even within the same market, there is usually a range in the weight of offerings. The average weight that prevails in each market represents a compromise between consumers' preferences and production conditions.

The buyers in any market represent many different kinds of consumers. Hotels and restaurants may want lighter birds than house-

wives prefer because of the way in which broilers are served in such establishments. Individual housewives, too, have their preferences. Most retail stores apparently fix retail prices per pound per broiler on a level basis regardless of weight, but they offer a range in size to meet different needs. In some parts of the country, there are premiums for heavy broilers or discounts for light ones. For example, higher prices appear to be paid for heavy broilers in New England than elsewhere.

How much higher a price would need to be to make each market weight as profitable as the most profitable weight under the conditions assumed in each of the three systems discussed in this bulletin is indicated in table 5. The necessary additional prices would differ slightly, depending on whether one started with a 25- or 30-cent price.

TABLE 5.—*Additional price per pound of broiler necessary to make any other weight class as profitable as the most profitable weight class under the assumed prices and conditions*

Weight (pounds)	System of operation					
	Single lot, with price of—		Continuous, labor limited, with price of—		Continuous, space limited, with price of—	
	25 cents	30 cents	25 cents	30 cents	25 cents	30 cents
	Cents	Cents	Cents	Cents	Cents	Cents
2.25-----	3.6	7.3	1.7	2.6	0.2	(¹)
2.50-----	2.4	5.3	1.0	1.6	(¹)	0.3
2.75-----	1.6	3.8	.6	.9	.1	.7
3.00-----	1.0	2.5	.3	.6	.3	1.4
3.25-----	.4	1.5	.1	.2	.4	1.9
3.50-----	.1	.7	(¹)	(¹)	.8	2.7
3.75-----	(¹)	.2	.1	.1	1.3	3.7
4.00-----	.1	(¹)	.5	.4	2.0	4.9
4.25-----	.4	(¹)	1.0	.9	3.0	6.4

¹ Most profitable weight class of broiler under assumed prices and conditions.

In the single-lot system, higher prices for broilers of lower weights would be necessary if these broilers were desired. A grower with limited space who produces continuously would need the greatest inducement to shift to higher market weights.

Choice of the Sex of Chicks

Most broilers are grown in mixed or straight-run lots without regard to sex. At times, however, a grower is faced with a choice between sexed or unsexed chicks. He may be interested in choosing male, female, or mixed chicks; or he may consider raising both male and female chicks, but in separate lots. Programming of the kind discussed here will help growers make decisions as to these choices.

A number of analyses of feed-production relationships have shown that cockerels grow faster than pullets and reach market weight with

less feed (2, 10). In the Card-Scott study, for example, cockerels reached a weight of 3 pounds with only 7.3 pounds of feed in about 65 days whereas pullets used 8.7 pounds of feed and took about 2 weeks longer to reach the same weight. The average rate of feed conversion to that weight for cockerels and pullets was 2.4 and 2.9 pounds of feed per pound of broiler, respectively. Returns above direct costs at each weight level were higher for cockerels than for pullets (table 6). If sexed male chicks could be bought at the same price as straight-run chicks, and the broilers sold at the same market price, it would be profitable to produce only cockerels.

TABLE 6.—*Direct costs and returns per 100 broilers for cockerels and pullets marketed at specified weights¹*

Weight (pounds)	Cockerels				Pullets			
	Age	Direct costs ²	Returns above direct costs when price per pound is—		Age	Direct costs ²	Returns above direct costs when price per pound is—	
			25 cents	30 cents			25 cents	30 cents
	Days	Dollars	Dollars	Dollars	Days	Dollars	Dollars	Dollars
2.25	54	46.27	9.98	21.23	60	50.56	5.69	16.94
2.50	57	49.86	12.64	25.14	65	54.68	7.82	20.32
2.75	61	54.07	14.68	28.43	72	59.47	9.28	23.03
3.00	65	58.43	16.57	31.57	80	65.58	9.42	24.42
3.25	68	62.37	18.88	35.13	86	72.28	8.97	25.22
3.50	72	66.57	20.93	38.43	92	78.81	8.60	26.19
3.75	76	71.34	22.41	41.16	100	88.48	5.27	24.02
4.00	80	76.54	23.46	43.46	108	101.41	-1.44	18.56
4.25	84	81.80	24.45	45.70				
4.50	88	87.56	24.91	47.41				

¹ Based on data from the Card and Scott experiment (2).

² Does not include cost of sexing chicks. See footnotes, table 2.

Occasionally, surplus male chicks may be available when female chicks are sold for replacement in breeder flocks. Usually, however, the sexes are available in equal numbers. Although returns above direct costs are less for pullets than for cockerels sold at ordinary market weights, at the same price, production of pullets is nevertheless profitable.

A more important question is whether it would pay to grow cockerels and pullets in separate rather than in mixed lots. This procedure might pay for intermittent growers who produce not more than 2 or 3 single lots a year, but even for these growers separate lots would be only slightly more profitable than mixed lots, unless a premium could be obtained for the heavier birds.

Continuous producers, as pointed out earlier, differ from intermittent single-lot producers who try to maximize returns from each lot. Continuous producers attempt to maximize returns for the year as a whole. Apparently still less advantage accrues to these growers when they produce pullets and cockerels in separate lots.

Returns above direct costs at different weights for pullets and cockerels under two systems of continuous production are presented in table 7.² The first system illustrates a situation in which labor is so limited that not more than 10,000 chicks can be started in each lot. The number produced becomes less at successively higher weights mainly because of the reduction in the number of lots per year. The weights to which it pays to grow cockerels and pullets differ considerably. At 25-cent broiler prices, the most profitable weight is 2.75 pounds for pullets and 3.75 pounds for cockerels. As pullets and cockerels are almost the same age at these weights, the end results are about the same as would be obtained with mixed lots. With broilers at 30 cents, there appears to be a slight advantage in growing pullets and cockerels in separate lots. However, the advantage is not great enough to make it worthwhile unless a higher price can be obtained for cockerels grown to heavy weights.

TABLE 7.—*Annual returns above direct costs from continuous production under assumed limitations of cockerels and pullets marketed at specified weights*

Weight (pounds)		Lots per year		Returns above direct costs with continuous production and price at—							
				25 cents a pound				30 cents a pound			
		Cock- erels	Pul- lets	Labor limited ¹		Space limited ²		Labor limited ¹		Space limited ²	
				Cock- erels	Pul- lets	Cock- erels	Pul- lets	Cock- erels	Pul- lets	Cock- erels	Pul- lets
		Num- ber	Num- ber	Dol- lars	Dol- lars	Dol- lars	Dol- lars	Dol- lars	Dol- lars	Dol- lars	Dol- lars
2.25	.....	5.37	4.93	5,152	2,685	5,359	2,805	10,960	7,993	11,401	8,351
2.50	.....	5.14	4.62	6,233	3,445	5,699	3,169	12,396	8,952	11,335	8,235
2.75	.....	4.87	4.24	6,838	3,733	5,585	3,074	13,242	9,263	10,817	7,629
3.00	.....	4.62	3.88	7,300	3,446	5,391	2,574	13,908	8,934	10,272	6,673
3.25	.....	4.45	3.65	7,993	3,073	5,386	2,099	14,873	8,641	10,021	5,901
3.50	.....	4.24	3.44	8,418	2,797	5,220	1,759	15,457	8,430	9,585	5,300
3.75	.....	4.06	3.20	8,604	1,568	4,945	917	15,893	7,146	9,682	4,178
4.00	.....	3.88	2.99	8,583	399	4,597	217	15,900	5,139	8,516	2,803
4.25	.....	3.72		8,550		4,290		15,980		8,019	
4.50	.....	3.58		8,367		3,951		15,915		7,515	

¹ It is assumed that labor is limited so that not more than 10,000 chicks can be started per lot.

² It is assumed that space is limited to 5,000 square feet.

In the system of continuous production with space limited, the advantage of growing the sexes separately is even less tangible. The most profitable market weight is little if any higher for cockerels than for pullets. The use of mixed lots would be practically as effi-

² The situations and assumptions are the same as those used in the earlier discussion for mixed lots.

cient as separate lots. The difference in returns is probably not enough to pay for the additional cost of sexing the chicks. Moreover, cockerels under 3.0 pounds are not as well finished as pullets and might sell at a lower price.

From this brief analysis, it is reasonable to conclude that the production of cockerels and pullets in separate lots would not result in materially higher returns to the grower unless heavy-weight cockerels could be sold at a premium.

The practice that is sometimes followed of removing pullets from a group of straight-run broilers at 2.25 to 2.5 pounds and continuing the cockerels to heavier weights may also be examined in the light of the preceding discussion. Even where substantial premiums are paid for the cockerels, this practice does not appear to have been widely adopted. Perhaps a major reason is the difficulty of making full use of space and overhead after removal of the pullets. Further analysis is needed to determine the conditions under which this would be profitable, but it is evident that high premiums for fairly heavy weights would be necessary.

PRODUCTION CHOICES AND CONTRACTUAL ARRANGEMENTS

The Business Firm in the Broiler Industry

Up to this point, broiler growers have been considered independent operators, who make most of their own economic decisions. This is perhaps less so for broiler growers than for farmers in most other types of farming. The usual situation in broiler production involves a contractual arrangement of some kind between the broiler producer and a feed dealer, processor, hatcheryman, or other financier. Arrangements of different kinds have developed in different areas, because of the need for furnishing credit and spreading risks. For example, a recent study of the Georgia broiler industry lists 42 different grower-dealer contracts, of which 18 are described as distinct types and 24 as further modifications (8). Many additional types of contracts are used in other producing areas (12 and 18).

A few of the more important types of arrangements are: (1) Cash; (2) open account; (3) flat fee per head or per pound of broiler; (4) feed-conversion payment; (5) share of returns above cash costs; (6) guaranteed prices for broilers and for items of cost; (7) guaranteed no loss; and (8) wage contract, straight salary, or rate per bird per week.

A grower's position is affected in many different ways by the contractual arrangement under which he operates. Perhaps the three most important aspects are risk, prices, and the extent to which he gives up the function of making economic decisions. One of the chief reasons for contracts from the grower's viewpoint is to transfer risk.¹⁰ To transfer risk, he may be willing to pay a higher price for feed and supplies and to surrender the right to make certain choices or decisions.

¹⁰ For both technical and financial reasons, risks are higher for the producer in broiler production than in most types of farming. A very large proportion of costs is represented by cash operating expenses, so that any unusual loss from disease or from an adverse turn of prices would cause a much heavier cash loss than in other types of farming.

Although the furnishing of credit is also an important element in most contracts, it would be of less consequence if risk were absent. Different types of contracts provide for these several functions in different degrees and ways. At one end of the spectrum of contractual arrangements, the grower is the operator of a fully independent firm; at the other, he is only a wage hand and has few of the attributes of a farm operator.

So long as the grower has a voice in deciding when and where to sell, the choice of the most profitable market weight may be determined by the way in which contractual arrangements affect the prices of feed and other supplies that vary with the weight of the broiler. A cash grower may be able to buy feed at a discount from the regular retail price, and the dealer may even adjust feed prices for different contracts to obtain different margins. Thus differences in contractual arrangements may shift the most profitable combinations of resources in the same way that other changes in relative prices of input and output items shift them. Ordinarily, however, the differences in feed prices between different types of contracts are not likely to exceed 10 percent, and this spread is not large enough to influence greatly the most profitable market weight.

The more important way in which the contractual arrangement affects choice is in transferring control of choices from the grower to the dealer-supplier or other financier. Among the eight broad types of arrangements listed above, producers who operate under a cash arrangement clearly have most control over their choices and operate as business firms. In some broiler areas, however, even these producers may not be completely independent. They operate in an imperfect market, and they may be forced to concede some of their independence of decision in order to be certain of having a market outlet. At the other end of the list, a man who is hired on a salary or wage basis is primarily a wage earner.

Other types of arrangements between these two extremes represent different degrees of independence or lack of it. The *open account* is a general label for a means of extending book credit for supplies, under which any number of special modifications may arise. Because the same dealer may offer several plans and may have a group of growers operating under each of them, some of the distinctions between plans may become blurred. A fieldman for the dealer may furnish essentially the same assistance to growers under several different contracts.

The *flat fee* per head or per pound of broiler is a type of contract in which the dealer appears to have the chief voice in making decisions. This comes close to being a type of wage contract.

A *feed-conversion* plan in which payment to a grower is adjusted according to an agreed scale that rewards the grower for greater efficiency in converting feed to broilers is also close to a wage contract.

Share contracts represent situations in which decisions are made jointly more frequently than in other types of contracts. Again, however, share contracts come in many sizes, shapes, and kinds, and general statements are difficult to make.

In a *guaranteed price* contract, the purchase prices for chicks and supplies are fixed and the selling price of the broiler is guaranteed at the outset. The grower's main task is to do as good a feeding and man-

agement job as possible. After the initial agreement, other economic decisions are largely in the hands of the feed dealer.

The *guaranteed no loss* contract is a form of open account in which the dealer takes any cash loss that may arise. The grower risks the loss of his time and the use of his housing and equipment. Here, too, the dealer makes the important decisions.

The Feed-Dealer Supplier as the Operator of the Key Firm

As previously indicated, studies of the commercial broiler industry in different areas show that there are many different contractual arrangements. The tendency toward a high degree of integration is general, however. The financier, who is most often a feed-dealer supplier, is in a key position to make the most important economic choices and decisions. In the strict economic sense, the dealer is the real producer, or entrepreneur. He plans the ventures, assumes the major risks, brings together the input resources, does the financing, usually decides when to start the operation, sells the product, and performs most of the functions of the business firm. Usually, he provides the chicks, feeds, and miscellaneous supplies under the terms of the contract. The grower usually furnishes housing, fixed equipment, and labor, but his role in the business choices and decisions is a minor one.

If the feed-dealer supplier is more often the real "farmer" who makes the main choices and decisions, it is desirable to analyze the problem from his viewpoint. In the eyes of the dealer, the economic problem is that of buying chicks, feed, and supplies at wholesale and arranging to place these resources with growers who are employed to process them into finished broilers. The various risks of mortality, diseases, and price fluctuations are spread over many separate flocks in the hands of different growers. They are spread over time by starting lots on different dates. The dealer is in position to figure his choices in terms of "average" relationships, although presumably he must allow for the fact that some growers are more efficient than others.

Many of the dealer's costs are fixed and many of his commitments to feed manufacturers, hatcheries, and processors tend to be fixed. He is interested, therefore, in maintaining a full flow of production so long as returns from broilers exceed variable costs, which to him are primarily the wholesale prices of feed, chicks, and supplies. Because the grower pays retail prices for the items he buys, the break-even points for dealers and growers are not likely to be the same under any given contract. In the margin between the wholesale prices he pays and the retail prices he charges, the dealer has a cushion. Part of his margin goes to meet current expenses for his labor force and other items, and part of it is necessary over any length of time to pay the overhead on his fixed investment and to cover the value of his own time. But in the short run, not all of these costs must be met and he may be better off to make temporary concessions rather than to shut down operations.

The decision as to the most profitable market weight for broilers could be arrived at by a dealer with a fixed number of growers in the same way as by an individual grower. Under the accounting systems

used by dealers in these integrated operations, however, the dealer sets the retail prices on the items advanced to the growers and the margins between the wholesale and retail prices are thought of as the gross earnings on feed, chicks, and other supplies. From long habit, a dealer may think of his operations in terms of earnings on the feed and supplies he sells. Yet, whether the business is regarded in terms of earnings on inputs or on the broiler outputs, it comes to the same end.

Actually, the problem is more complicated for dealers than for growers because of further differences in the fixity or flexibility of resources. A dealer must keep in mind the physical capacity of his central plant for handling feed, the size of his labor and field forces, and the limitations on his working capital. In addition, there is the question of competition with other dealers for the available growers in the community. Growing space may be more or less inflexible for the dealer than for the grower himself.

The Composition of Returns to Dealers

Information concerning the economics of dealer operations is incomplete. The fragmentary data available do not permit us to present a complete budget for a typical dealer that will show his costs and returns in detail. We *can* illustrate the nature of the problem in terms of margins above wholesale prices and for a selected type of dealer-producer contract. Returns so calculated represent returns from which expenses for all other costs, including costs for the labor force of the dealer's organization, must be met. Returns at different market weights are shown for the three systems of operation studied earlier (table 8, fig. 7).

For the type of contract used in this illustration, the most profitable weight under the single-lot system appears to be somewhat higher for feed dealers than for growers. A similar situation exists under the continuous production system with labor limited. Under the continuous production system with space limited, however, lower weights appear to be even more favorable for the dealer than for the grower. The chief reason is the margin made on the additional quantities of feed sold. An additional reason is the higher return from the margin on baby chicks as greater numbers are raised at low weights.

The differences in returns to dealers between weight groups are not great as compared with those for growers. Also, the welfare and goodwill of his growers might well be more important to a dealer than a few marginal dollars.

Under other types of contractual arrangements, the position of the dealer varies. If the contract is a form of wage agreement on either a time or a piece-rate basis, the position of the dealer is more nearly like that of the independent producer. At the other extreme, if feed and supplies are sold on open-account credit, the dealer's interest becomes mainly that of selling the largest volume of feed and other supplies.

The information in table 8 focuses on the problem of the most profitable market weight under each of the three operating systems. The analysis is not designed to answer the further question of what system of grower-operation the dealer would choose if he could select a group

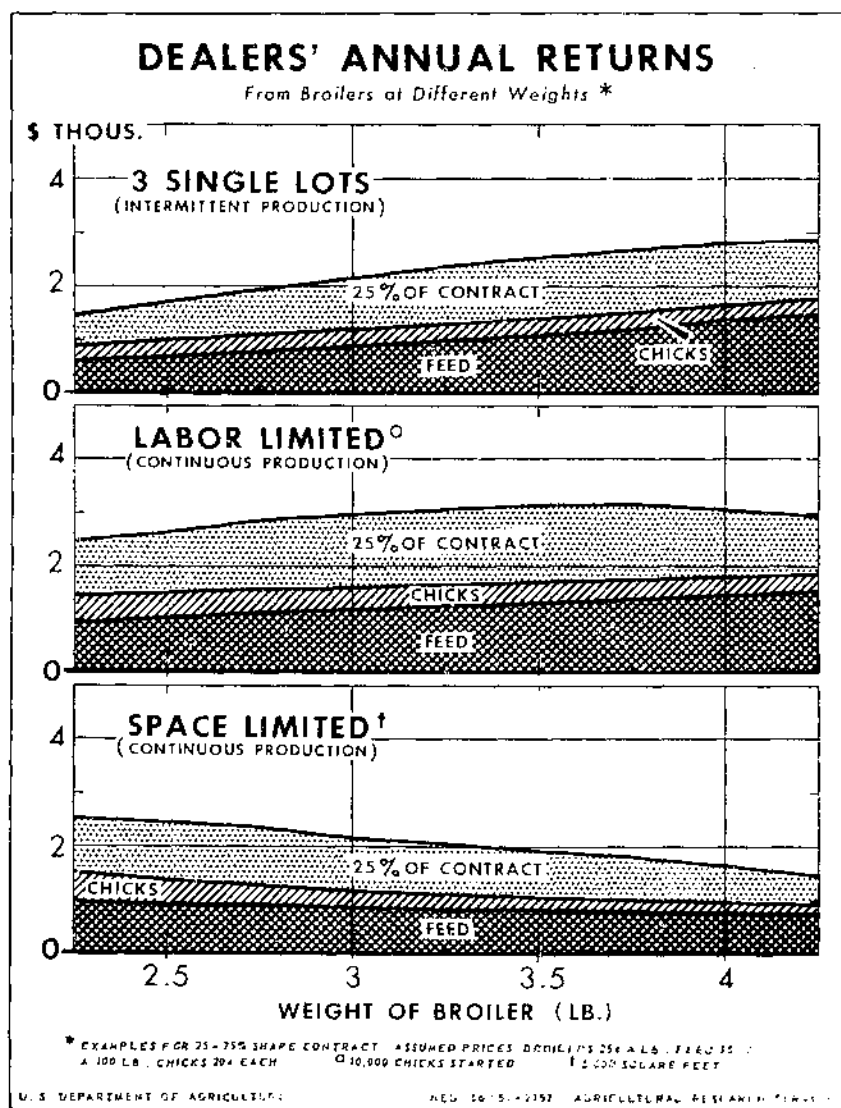


Figure 7.—The dealer's returns under a share contract are made up of three items: His margin on feed, his margin on chicks and other supplies, and his share of the returns above retail costs under the terms of the contract.

of growers all of whom operated under the same system. The comparative magnitudes of the dealer returns shown under each system are merely a consequence of the assumed conditions set up for each system. They tell us nothing about the relative profitability of any one system compared with others.

The question deserves some comment in passing, however, even though its analysis lies beyond the present study. Obviously, if a feed dealer had access to an unlimited pool of producers operating

TABLE 8.—*Estimated annual returns to feed-dealer supplier for broilers marketed at specified weights, three alternative systems of operation with indicated assumptions*¹

Weight (pounds)	Intermittent, with 3 single lots of 10,000 chicks started				Continuous, with labor limited to 10,000 chicks started				Continuous, with space limited to 5,000 square feet			
	Returns from feed ²	Returns from chicks ³	Share from contract ⁴	Total dealer returns	Returns from feed ²	Returns from chicks ³	Share from contract ⁴	Total dealer returns	Returns from feed ²	Returns from chicks ³	Share from contract ⁴	Total dealer returns
	<i>Dollars</i>	<i>Dollars</i>	<i>Dollars</i>	<i>Dollars</i>	<i>Dollars</i>	<i>Dollars</i>	<i>Dollars</i>	<i>Dollars</i>	<i>Dollars</i>	<i>Dollars</i>	<i>Dollars</i>	<i>Dollars</i>
2.25-----	577	300	592	1,469	940	510	964	2,414	981	538	1,006	2,525
2.50-----	663	300	748	1,711	1,013	480	1,143	2,636	930	445	1,050	2,425
2.75-----	759	300	866	1,925	1,109	460	1,264	2,833	909	381	1,037	2,327
3.00-----	856	300	983	2,139	1,166	430	1,336	2,932	864	322	990	2,176
3.25-----	954	300	1,096	2,350	1,234	410	1,418	3,062	836	281	960	2,077
3.50-----	1,063	300	1,172	2,535	1,303	390	1,436	3,129	813	246	896	1,955
3.75-----	1,182	300	1,205	2,687	1,369	370	1,396	3,135	792	216	808	1,816
4.00-----	1,322	300	1,165	2,787	1,444	350	1,272	3,066	779	191	686	1,656
4.25-----	1,475	300	1,082	2,857	1,512	330	1,108	2,950	765	169	561	1,495

¹ This is an illustrative example for a situation with a 25-75 share contract. Prices for broilers are assumed to be 25 cents a pound and prices for feed and other cost items are those assumed in earlier tables.

² Dealer's margin assumed to be 7.5 percent on feed that retails at \$5 per 100 pounds.

³ Margin on chicks and supplies estimated at 1¢ per chick started.

⁴ Dealer gets 25 percent of the returns above cash costs at retail prices.

under the different systems, he could organize with enough growers following any one system in such a way as to sell approximately the same quantities of feed, chicks, and supplies. He could make the same net returns above wholesale prices. There would be some small differences in the proportions of feed, chicks, and other supplies, but these would be of little concern to him. The chief factors that might need consideration would be the number of growers and the territory covered. The system of continuous operation with labor limited would require the smallest number of growers. Continuous production with space limited would be next, and intermittent growers would need to be highest in number.

The number of growers in the orbit of a feed dealer may affect his returns if he is forced to spread his supervisory field staff too thin, or if the geographic spread in location adds to costs of operation in other ways.

The best longtime interests of both dealer and growers in a commercial broiler area lie in the direction of continuous grower operation on a scale large enough to utilize fully the grower's labor supply and with space not a limiting factor.

The problem of the optimum number of growers per dealer and the optimum size of territory needs further economic analysis. Some recent broiler marketing studies throw light on the problem (9, 12), but further analysis would be desirable. Risk, financing, and competitive status among dealers are involved as well as size and efficiency of operation.

Other Factors That Influence Dealers' Choices

A dealer's decisions about market weights and other problems connected with broilers are also influenced by competition from other dealer-operators. In an expanding phase of the industry in his area, including his own business, competition for growers may be keen. The financial resources of a dealer, like those of an individual grower, may be limited. He may have to choose between using his resources with his present group of growers, or reducing the amount of credit he extends to each and adding more growers. That is, anticipated future returns from larger scale operations may be more attractive than slightly higher current returns. If capital is limited and the industry is expected to expand in the area, the tendency will be toward lower marketing weights than would be most profitable under more fully developed and stabilized conditions.

Since its inception, the commercial broiler industry has constantly expanded. In most areas, it has not yet reached what might be termed a stabilized condition. This means that there are probably more limitations of various kinds than may be the case when the growth phase levels out. These limitations may have had something to do with keeping market weights down in these areas.

The interest that feed-dealer suppliers in each commercial broiler area have in broiler production has been a matter of evolution. Frequently, beginning with feed sales, dealers gradually become involved in financing and management problems in order to protect their investments. In many instances, it is not fully realized how involved dealers are in the production and marketing of broilers.

The central position of feed dealers has had several advantages for the broiler industry. The control and treatment of disease have been uniform and reliable because of the specialized attention of feed dealers' servicemen (9). Mortality risks have been distributed. New technology has been brought into use rapidly. Price risks have been reduced.

The function performed by a field serviceman is something like that of a special farm extension agent or the special assistance given under the Farmers' Home Administration Program in connection with supervised credit.

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