PRODUCING EGGS IN NEW JERSEY

An Economic Study

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CONTENTS

	Page
SUMMARY	1
INTRODUCTION	1
NATIONAL TRENDS IN PRODUCTION AND PRICES	2
REGIONAL TRENDS	7
COMMERCIAL POULTRY FARMS IN NEW JERSEY	10

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By Edward J. Smith, Agricultural Economist

SUMMARY

Since 1930, production of chickens and eggs has increased more than has that of dairy products and red meats, despite the relatively lower prices received for chickens and eggs. More efficient poultry production explains at least part of this shift.

Broilers have replaced farm flocks of chickens as the main component of chicken meat marketings, because of (a) rapid increases in broiler production, (b) fewer hens required for a given volume of egg production with the higher rate of lay per bird, and (c) the increased use of sexed chicks, which has reduced greatly the number of cockerels raised by egg producers in replacement flocks.

Average flock size has increased steadily since 1930, partly because of the elimination of many small farm flocks and partly because of the trend toward larger commercial flocks. This development has been pronounced in the Northeastern States, especially in New Jersey.

There appears to have been a gradual but steady concentration of egg production in the Northeastern States. In 1957, total United States egg production was only about two-thirds greater than the 1935-39 average. In the Northeastern States, however, production doubled in the same period, and production in New Jersey was about four times the 1935-39 average. Recent sharp increases in production of eggs in several Southern States suggest a shift in this trend.

In trying to improve efficiency and maintain their competitive position, New Jersey poultrymen have made several changes. Among the more important of these are an increase in size of flock, a higher rate of lay per hen, more widespread use of cleaners, graders, and automatic feeders to replace hand labor, and the raising of several lots of replacement birds so as to use production facilities and labor more efficiently throughout the year. Despite these changes, unfavorable cost-price relationships have depressed earnings in recent years.

The net farm income of the poultryman is particularly sensitive to changes in the prices of eggs and feed. For this reason, change in egg and feed prices is the main reason for the year-to-year variations in the earnings of typical egg producers.

INTRODUCTION

The postwar period has been one of especially rapid change for commercial egg producers. Even more than in many other lines of agricultural production, size of operation has increased, rates of production have gone up, and new methods have been used to save labor and use production resources more effectively. These changes seem to have been most striking in the Northeastern States, where the relatively large number of commercial poultrymen are attempting to meet both competition from egg producers in other areas and competition from other food products (fig. 1).

The main purpose of this report is to describe and analyze the more important changes that have occurred since the end of World War II in one of the most concentrated

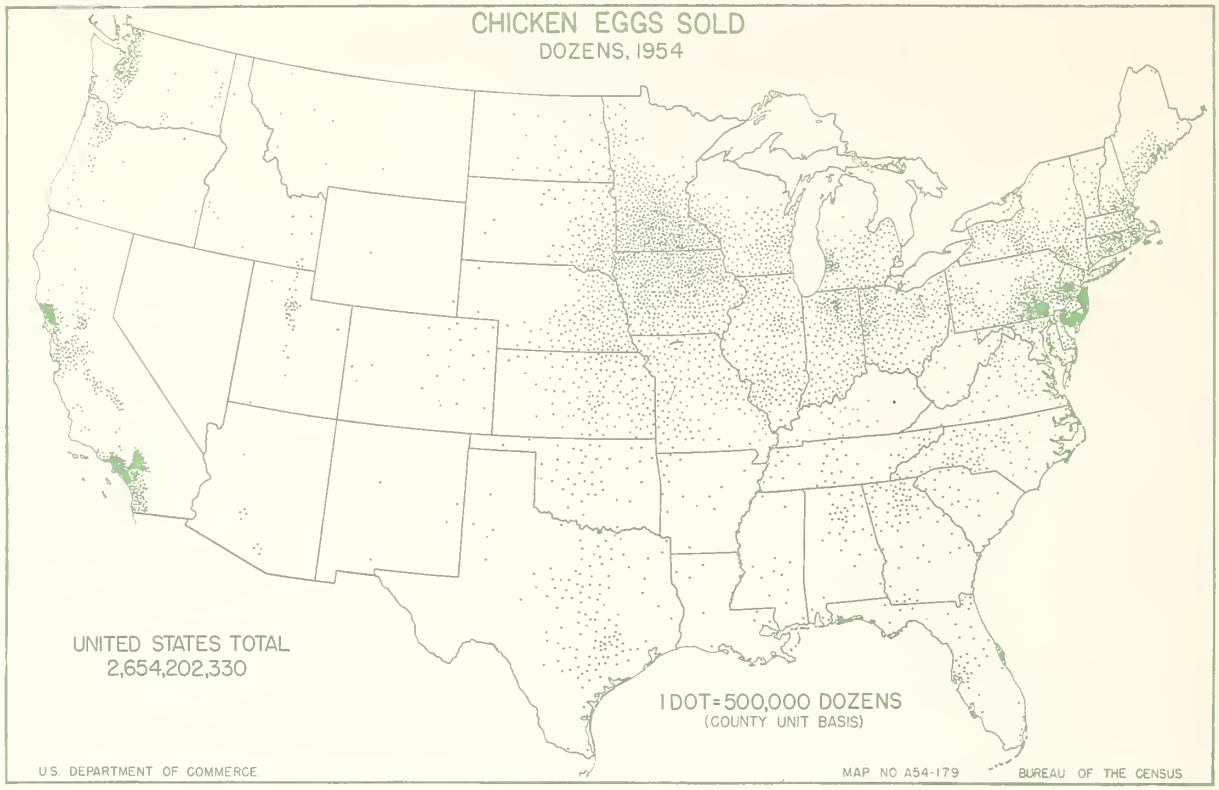

Figure 1

commercial egg-producing areas in the Northeastern States--central and southern New Jersey. This is one of several studies of adjustments, costs, and returns on commercial family-operated farms.[1]

Adjustments made by commercial poultrymen in New Jersey during the postwar years were mainly attempts to maintain or improve their competitive position. Thus, the basic causes that brought about these changes--national production and price trends in eggs and competing products, new technological developments, and the like--are not confined to the particular area under consideration. They have a much wider geographic setting. Therefore, before turning to the main task of the study reported, some of the national and regional trends that have influenced the changes that have occurred in the New Jersey area are sketched.

NATIONAL TRENDS IN PRODUCTION AND PRICES

One of the more significant developments in agricultural production since the early thirties has been the divergent production and price trends of poultry products on the one hand, and of red meats[2] and milk on the other. Christensen and Mighell[3] called attention to this in their comprehensive study of the poultry industry nearly a decade ago, and the contrast has become even more marked since that time, particularly with respect to broiler production.

[1] For the latest annual estimates on all these farms, see U. S. Agricultural Research Service, Farm Economics Research Division, Farm Costs and Returns: Commercial Family-Operated Farms by Type and Location, U. S. Dept. Agr. Agr. Inform. Bul. 176, 70 pp., illus. Revised August 1959.

[2] The sharp increase since 1950 in the production line for red meats in figure 2 is considered to be more of a cyclical buildup than a long time trend line.

[3] Christensen, R. P., and Mighell, R. L., Competitive Position of Chicken and Egg Production in the United States, U.S. Dept. Agr. Tech. Bul. 1018, 58 pp., illus. 1950.

As a result mainly of the spectacular expansion of the broiler industry, production of chicken meat has increased rapidly since 1930, as shown in figure 2. Although since the late thirties, production of eggs has increased less rapidly than production of chicken meat, it has still increased between two and three times as much as production of milk and, until the recent cyclical increase, more than production of red meats. This increase occurred despite the relatively lower prices for eggs and chicken meat shown in figure 3. An additional indication of the less favorable economic climate for egg producers is given by the declining egg-feed price ratio shown in figure 4. Had the price relationships of the 1935-39 period continued into the late fifties, the relative increase in production of poultry products probably would have been much greater.

But the more than twofold increase in production of chicken meat since the 1935-39 period is only part of the story. This increase was a result of the tremendous expansion in broiler production, which more than offset the steady decline in marketings of farm chickens (fig. 5). Broiler production was not important enough to be reported separately before 1934, and prior to the end of World War II, it did not exceed a fourth of the total production of chicken meat. During the postwar period, broilers have steadily increased their share of the market; they accounted for nearly 80 percent of all chicken meat produced in 1958.

The absolute changes in this period are even more striking. While marketings of farm chickens dropped from 2,144 million pounds in 1947 to only 1,050 million pounds by 1958, broiler marketings skyrocketed to 5,431 million pounds, or slightly more than five times their 1947 volume. All this occurred in hardly more than 10 years.

What is responsible for these changes in production patterns? According to Christensen and Mighell, rapid improvements in production efficiency reduced the real costs of producing eggs by nearly 15 percent between 1925-29 and 1945-49.[4] One of the main factors responsible for this increased efficiency was the steady improvement in the rate of lay from about 130 eggs per layer in the 1925-30 period to slightly above 160 in 1945-49. Because labor requirements, feeds, flock replacement, and other costs did not rise proportionately, a reduction was brought about in these costs per dozen eggs produced.

The rate of lay has continued upward since the late forties: in 1958, it averaged 201 eggs per layer for the United States as a whole. This increase suggests that further improvements in efficiency have powered the continued moderate increases in egg production of the last 10 or 15 years. Since the end of World War II, this gradual expansion in egg production has been achieved with a steadily declining number of layers. The average number of layers on hand in 1958 was down almost one-fourth from the peak numbers of 1944 (fig. 6). This decrease has been a contributing factor in the shrinkage of the proportion of farm chickens in the total production of chicken meat; it means fewer farm chickens sold in relation to a given volume of egg production.

The rapid shift toward the use of sexed chicks has had a similar effect. In 1943, only about 17 percent of the egg-type chicks bought from United States hatcheries were sexed pullets. By 1957, the proportion had risen to 60 percent, and in the Middle Atlantic States to 74 percent. The corresponding reduction in the purchase of straight-run chicks has brought about a steady decline since 1943 in the number of young farm chickens marketed.

Three factors, then, are mainly responsible for the rapidly changing composition of marketings of chicken meat: (1) The dramatic expansion of broiler production in the last 25 years; (2) the higher rate of lay per hen, which means that fewer layers are needed for a given volume of egg production; and (3) the use of sexed chicks and the resulting decline in marketings of young farm chickens. Together, these three trends have reduced the share of farm chickens to only 22 percent of the total number of pounds of poultry meat marketed, whereas 25 years ago farm flocks accounted for virtually all of it.

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[4] See footnote 3, page 2.

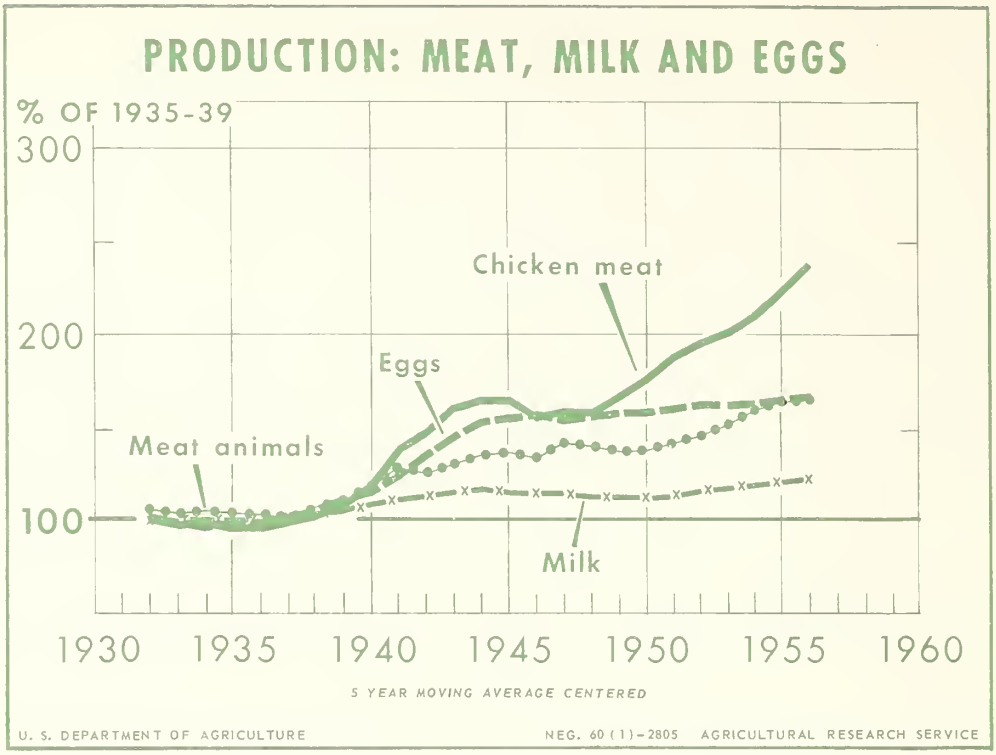

Figure 2

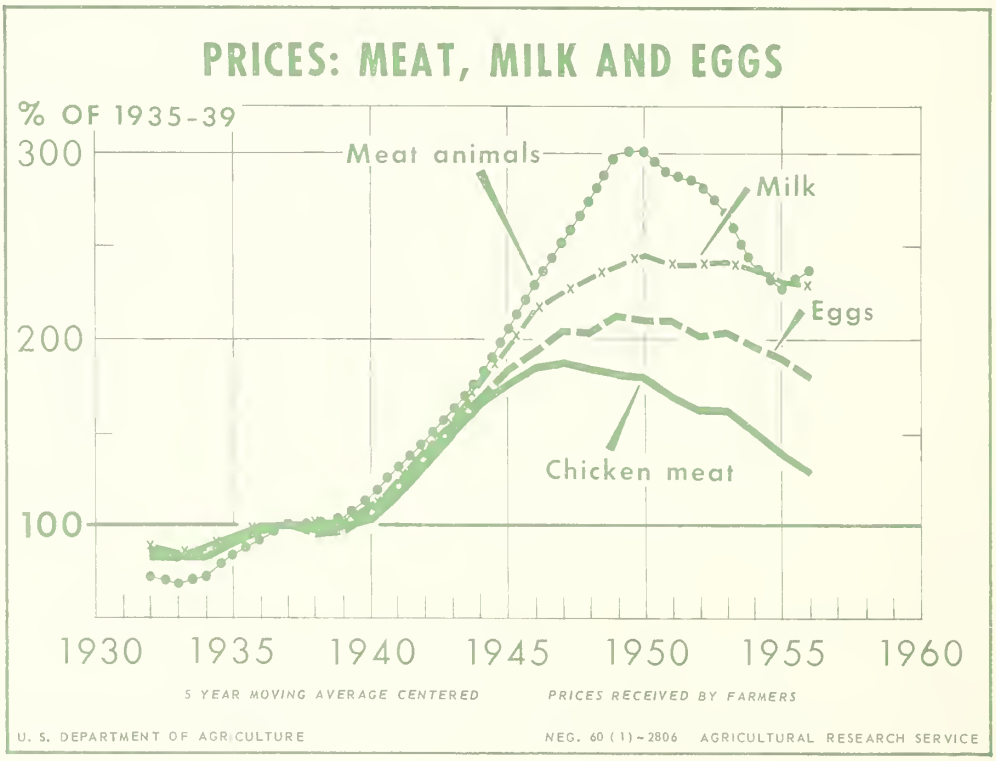

Figure 3

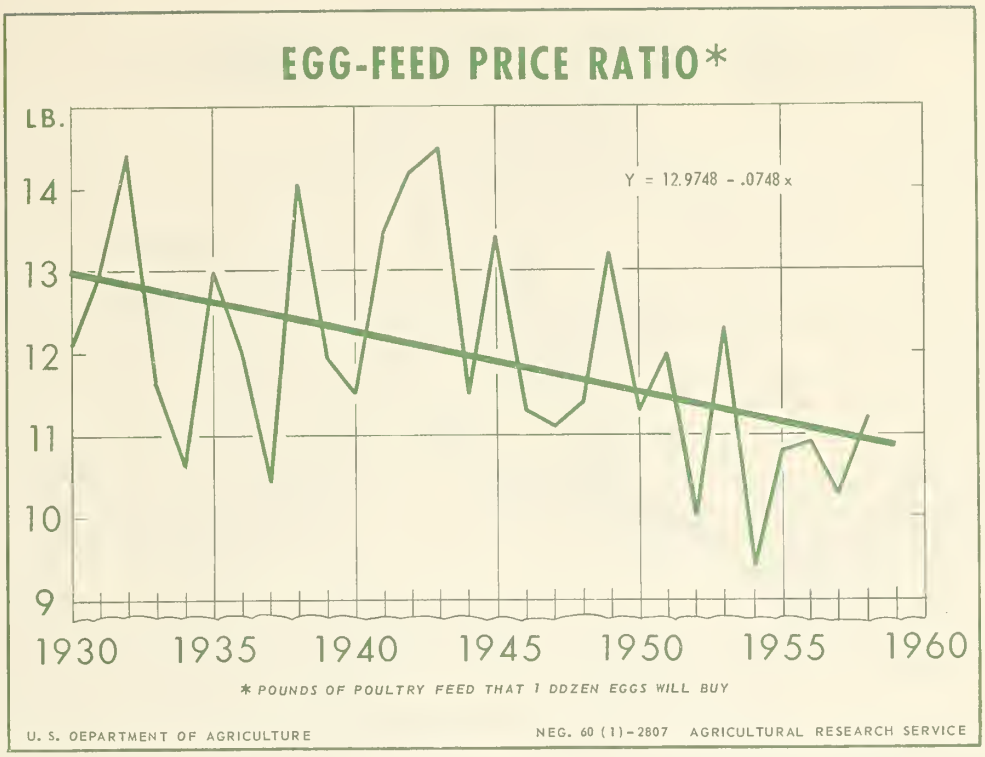

Figure 4

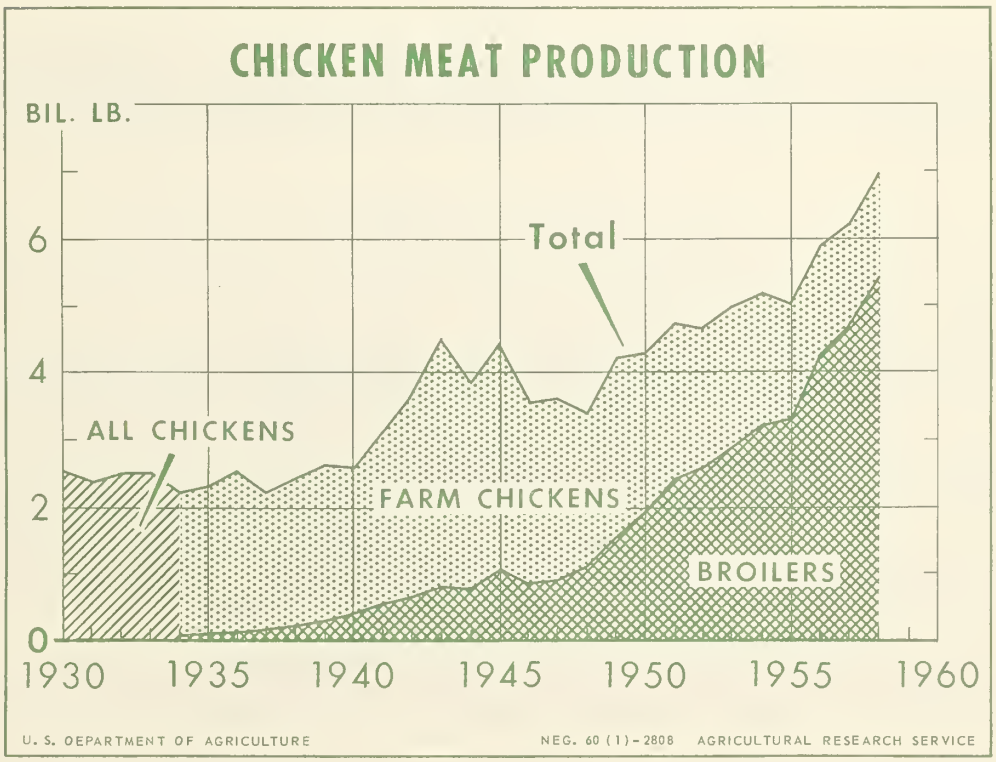

Figure 5

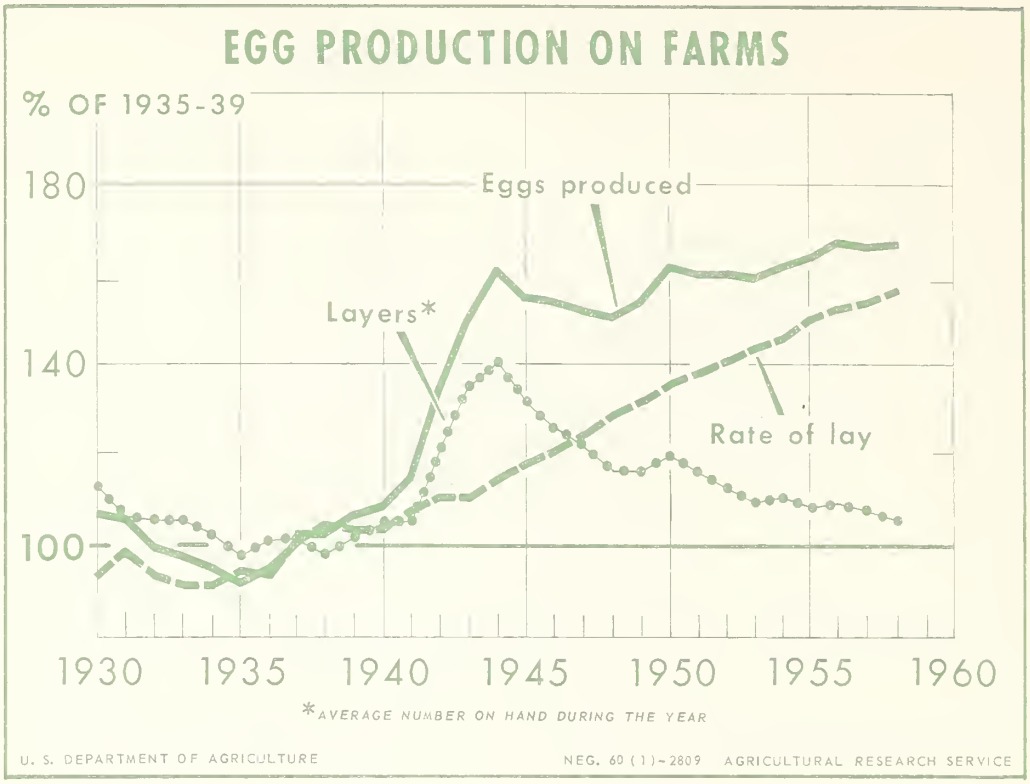

Figure 6

It is true that egg production has increased somewhat since 1945, and that there has been a declining trend in the egg-feed price ratio. However, it would be a mistake to blame this entirely on the increase in production. Actually, the percentage increase in U.S. population since 1945 was about three times the 8-percent increase in egg production.

Two other factors appear to be at least equally responsible. First, the volume of eggs removed from the domestic market under Federal price-support programs since 1950 has been only a small fraction of the quantities so removed in the 10 years from 1941 through 1950.[5]

Second, people now eat fewer eggs per person than they ate shortly after World War II, despite the inducement of lower prices. Per capita domestic disappearance was estimated at 402 in 1945, and at 379 in 1946.[6] By 1958, this figure was down to about 350.

In the late thirties, when a higher proportion of the egg supply was produced by small farm flocks than is the case today, it was fairly common to start one lot of chicks in middle or late spring. Usually, the pullets did not begin to get into full production until late fall. The layers kept over from the previous year went through their molt in early fall, during which time production was reduced sharply. As a result, egg supplies were lightest in fall and heaviest in late spring and early summer (fig. 7).

Egg producers, eyeing this regular pattern of considerably higher prices in the fall, began to shift their seasonal production patterns to take advantage of it. Chicks were started earlier, and more and more producers began raising two and three lots during

[5] U. S. Agricultural Marketing Service. Egg and Poultry Statistics Through 1957, U. S. Dept. Agr., Statis. Bul. 249, 183 pp. 1959. See page 151.

[6] See footnote 5.

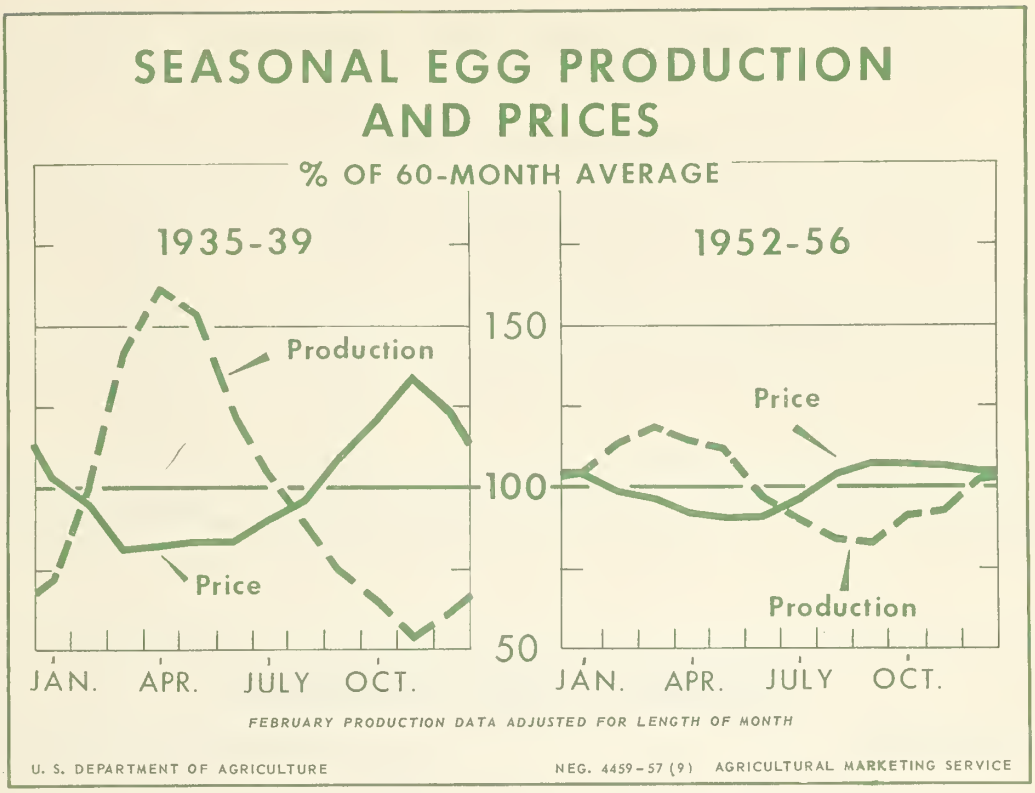

Figure 7

the year rather than one. Use of automatically controlled lights became common. The seasonal variations in egg production had begun to flatten out by the late forties and by 1952-56, they had become even more uniform. This decrease in seasonal variation greatly reduced the amplitude of the seasonal swings in egg prices, as shown in figure 7.

REGIONAL TRENDS

From 1954 to 1958, egg production in the United States averaged about 63 percent above that for 1930-34 (table 1). In the latter period, the nine North Atlantic States (New England plus New York, New Jersey, and Pennsylvania) more than doubled their egg production and slowly but steadily increased their share of the national total from about 13 to 18 percent. All other geographic areas either stayed about the same in relative importance during this period or registered declines. Although Alabama, the Carolinas, Georgia, and Florida have shown substantial increases in egg production in recent years, production in other Southern States has declined. As a result, the South Atlantic region's share of the national production has increased only slightly since 1950, and the share of the South Central States has declined.

A glance at table 1 reveals an uneven pattern of increase within the North Atlantic area. For example, New York lagged behind even the increase in national production, showing only a 33-percent increase from the 1930-34 level. At the other extreme, New Jersey led the field with a 1954-58 production of nearly 4 1/2 times that of the early thirties. In New York, Pennsylvania, Vermont, and Rhode Island, which failed to equal the rate of increase in the North Atlantic area as a whole, dairy production makes up a large part of the farm income.

A second kind of concentration is occurring in the Northeastern States. Not only is a larger share of the national egg production coming from these States, but, in line with the national trend, it is coming from fewer and larger flocks within the area.

TABLE 1.--Egg production on farms, North Atlantic States and United States, annual averages, 1930-34 and 1954-58

Area	1930-34	1954-58	Percentage increase
	Millions	*Millions*	*Percent*
Maine	205	671	227
New Hampshire	129	461	257
Vermont	92	197	114
Massachusetts	307	742	142
Rhode Island	39	85	118
Connecticut	237	694	193
New York	1,504	1,994	33
New Jersey	556	2,491	348
Pennsylvania	1,750	3,593	105
North Atlantic States	4,819	10,928	127
United States	36,768	60,085	63

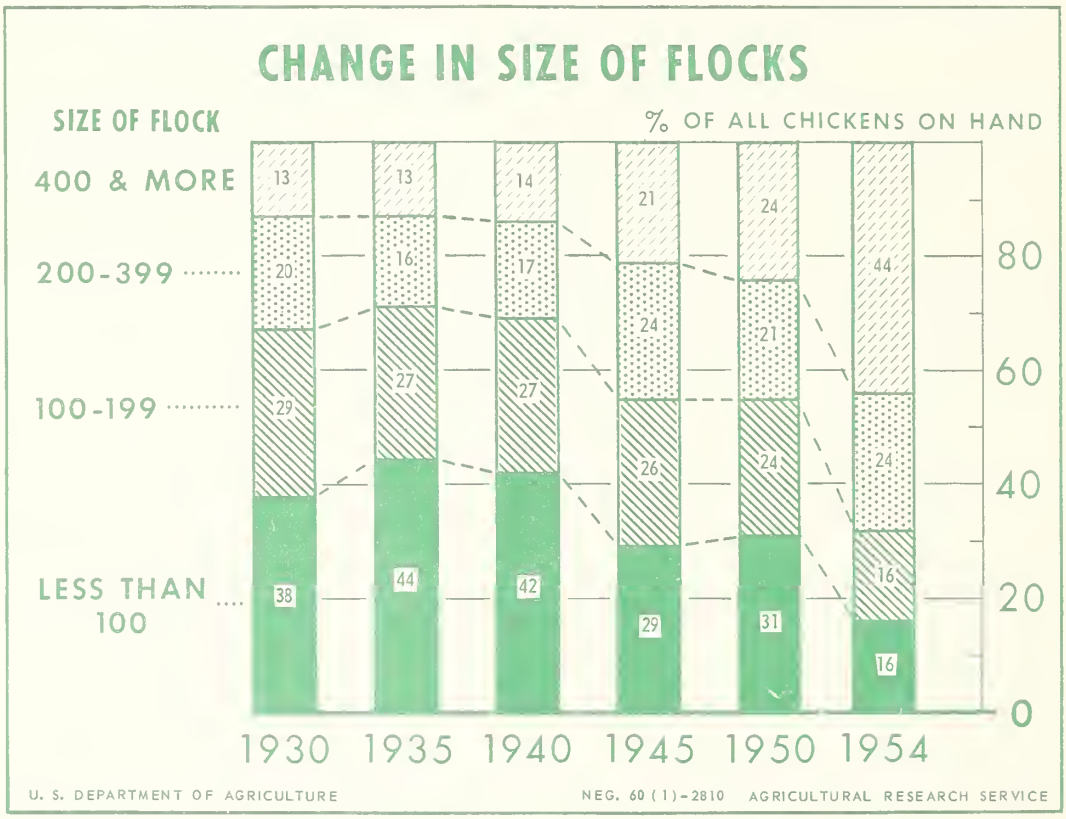

Figure 8

For many years, the main source of our national egg supply was the small farm flock. These sideline enterprises furnished the chickens and eggs used by the farm family. In addition, they provided a small cash income, but accounted for a very minor part of the total farm production. Even as late as 1930, the widely dispersed nature of egg production was indicated by the fact that in that year on 85 percent of our farms some chickens were

kept--varying from 69 percent in the Pacific Coast States to more than 90 percent in the North Central States. Also in 1930, 67 percent of our chickens were in flocks of less than 200 layers, and 87 percent were in flocks of less than 400 layers (fig. 8).

By 1954, this situation had changed. In that year, the census reported that the percentage of United States farms with chickens was down to 71 percent, and that only 32 percent of the chickens were in flocks numbering less than 200. But the percentage of chickens in flocks of 400 or more jumped from 13 percent in 1930 to 44 percent in 1954.

A breakdown of the 400-plus group further illustrates the trend toward larger flocks. The first two size groups shown in table 2 more than doubled their relative importance, but the 1,600 to 3,199 group jumped to five times its 1935 share, and the group with 3,200 layers and over increased in relative importance by more than 10 times.

This trend toward commercial egg production in fewer and larger flocks is considerably more pronounced in the Northeast than for the country as a whole. Although the number of United States farms reporting chickens on hand dropped from 85 percent in 1930 to 71 percent in 1954, the corresponding decline in the New England States was from 73 to 46 percent and in the Middle Atlantic States from 87 to 61 percent.

The faster rate of increase in egg production in the Northeast than for the United States as a whole and the more rapid decline in the number of farms keeping chickens mean more large flocks in the Northeast. Although only about 6 percent of the flocks in the United States numbered more than 400 layers in 1954, almost 26 percent of those in the Northeast and nearly 60 percent of those in New Jersey were in this group (table 3).

The contrast is even more striking in terms of number of chickens than in terms of number of farms in the various size groups. Whereas in 1954, the proportion of chickens in flocks of less than 400 was 56 percent for the United States, the percentage was 15 in the Northeast and only 3 in New Jersey. But 58 percent of New Jersey's chickens and 34 percent of those in the North Atlantic region as a whole were in flocks of 3,200 or more, while only 12 percent of the chickens in the United States as a whole were in flocks of this size.

It is equally revealing to compare the flock-size groups in the Northeastern States with the corresponding United States total. For example, while the 1954 census reported that the North Atlantic States contained only 5.5 percent of all the commercial farms in the United States, they had 45 percent of the flocks with 1,600 to 3,199 chickens and more than half of the flocks with 3,200 chickens and over (table 4). New Jersey, with only 0.4 percent of the country's commercial farms and 0.2 percent of the flocks of less than 400, had more than a fourth of the flocks of 3,200 or more.

TABLE 2.--Percentage of all chickens on hand in flocks of 400 and more, by size of flock, United States, 1935 and 1954

Flock size	1935	1954
	Percent	*Percent*
400 to 799	6.3	14.3
800 to 1,599	3.6	9.1
1,600 to 3,199	1.7	8.6
3,200 and over	1.1	12.1
Total	12.7	44.1

TABLE 3.--Percentage distribution of commercial farmers reporting chickens on hand and of number of chickens reported by size of flock, New Jersey, North Atlantic States, and United States, 1954

Flock size	Farmers reporting			Number of chickens		
	New Jersey	North Atlantic States	United States	New Jersey	North Atlantic States	United States
	Percent	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
Less than 400	41	74	94	3	15	56
400 to 799	10	12	4	3	13	14
800 to 1,599	13	7	1	9	17	9
1,600 to 3,199	18	4	1	27	21	9
3,200 and over	18	3	(1)	58	34	12
All flocks	100	100	100	100	100	100

[1] Less than 0.5 percent.

TABLE 4.--Commercial farmers reporting chickens on hand and number reported: New Jersey and North Atlantic States as percentage of United States, by size of flock, 1954

Flock size	Farmers reporting			Number of chickens		
	New Jersey	North Atlantic States	United States	New Jersey	North Atlantic States	United States
	Percent	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
Under 400	0.2	4.3	100	0.2	5.0	100
400 to 799	1.1	15.5	100	1.2	16.3	100
800 to 1,599	4.7	32.7	100	5.1	33.6	100
1,600 to 3,199	14.4	45.4	100	15.3	46.0	100
3,200 and over	26.8	53.1	100	23.4	50.6	100
All flocks	.4	5.5	100	4.9	18.2	100

COMMERCIAL POULTRY FARMS IN NEW JERSEY

The preceding sections describe some of the more important national and regional trends that have occurred in the poultry industry since 1930. From the standpoint of the egg producer in New Jersey and other highly concentrated producing areas, these trends spell keener competition. One of the most significant indications of this is the continued expansion of egg production in the face of less favorable price-cost conditions, as witnessed by the general downward trend of the egg-feed price ratio. (See figure 4.)

Specialized egg producers in the Northeast, in turn, have made many changes in their operations in an attempt to maintain or improve their competitive position. They have expanded steadily the size of the laying flocks in order to spread fixed costs over more units of product. They have supplemented family and hired labor with mechanical feeders and automatic egg graders. Better strains of birds and better feeding methods have helped increase the rate of lay per hen. These and other changes that have occurred since 1945, together with attendant changes in income, are the subject of this section.

New Jersey has a high concentration of commercial family-operated poultry farms with fairly uniform characteristics. Most of them are highly specialized. Their operators seldom produce crops; usually, they buy their entire feed requirements. Very few attempt to retail many of their eggs. The operator and members of his family, who ordinarily furnish most of the labor needed, usually concentrate on the production end and sell their eggs through wholesale outlets. Although some New Jersey poultrymen buy started pullets, typically they buy sexed chicks and raise their own replacements from them.

As so many of these farms are similar in their main characteristics, changes in their production, incomes, and expenses can be described effectively in terms of a single composite farm. For this purpose, census data, information gathered by the Agricultural Estimates Division, Agricultural Marketing Service, and the results of special poultry farm survey studies are used in developing the series. In this way, estimates for a single representative farm are made which apply reasonably well to a large number of commercial poultry farms in the State and elsewhere.

The average number of layers on hand during the year on these farms has increased from about 2,100 in 1945 to about 4,100 in 1958 (table 5).[7] Total investment was only a little above $22,000 in 1945, but by 1958, it had risen to more than $50,000 (table 6). A good bit of this increase was due to higher prices, but even when valued at 1947-49 prices, the 1958 investment was more than a third higher than that of 1945.

The average number of layers on hand during the first 2 years (1945 and 1946) of the series was only about two-thirds of the number on hand at the beginning of the year. This proportion gradually increased as the starting of more than one lot of chicks during the year became common. In recent years, it has held at around 90 percent of the January 1 numbers. By keeping the size of the laying flock more nearly uniform throughout the year, poultrymen can make fuller use of their buildings, equipment, and regular labor force. This, together with the spreading of fixed costs over more units of product with larger flocks, has been an important source of the improvement in productive efficiency that has occurred on these farms.

As previously mentioned, these commercial poultry farms are largely family undertakings. Their operators usually devote their full time to the business, and often the wife and children also spend a large part of their available time in the poultry house or the egg room. The importance of the poultryman's family as a source of labor for the farmwork is indicated by the estimates of hours of family and hired labor for the 1945-58 period shown in table 6.

Until about 1951, hired labor made up about a fourth of the total number of hours of labor used. Since then, the proportion of hired labor has shown a tendency to decline, probably because of its higher cost and the lower earnings that have prevailed on these farms. Much of the help that is hired is part-time work by high school boys, and older men. A man and a truck may be hired to help in cleaning out the poultry houses.

Bulk feed handling, coupled with the use of automatic feeders, have resulted in substantial labor savings and enabled egg producers to expand their flock size without additional help. However, studies of commercial poultry farms in New York indicate that even greater percentage reductions have been effected in the time required to prepare the eggs for market than in the care of the poultry flock itself.[8]

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[7] Changes in January 1 numbers of layers on hand are based on the 1945, 1950, and 1954 Censuses of Agriculture. In order to have the series represent a clearly commercial operation, a constant number (2,500) was added to the median number of layers on poultry farms in New Jersey in each census year, adjusted to a January 1 basis. The census includes as commercial poultry farms many farms operated on a part-time basis or by semiretired individuals. A simple straight-line trend was fitted to these estimates as the basis for the numbers on hand at the beginning of intercensal years. This procedure somewhat overstates the rate of increase in size of flock that has occurred on the typical commercial poultry farm, because part of the upward trend is a reflection of the fact that many smaller poultrymen have gone out of the poultry business altogether, rather than attempting to increase the size of their poultry operations.

[8] Kearl, C. D., Commercial Poultry-Farm Management in New York State, 1946-47, Cornell Agr. Expt. Sta. Bul. 864, 22 pp., illus., 1950; and Tobey, J. S., Seasonal Returns from Marketing Eggs, Cornell Agr. Expt. Sta. Dept. Agr. Econ. A. E. 1059, 35 pp., 1957.

TABLE 5.--Organization, production, and receipts on commercial family-operated poultry farms, New Jersey, 1945-58

Item	Unit	1945	1946	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958
Layers on hand, January 1:															
Hens	Number	930	960	990	1,020	1,050	1,080	1,116	1,152	1,188	1,224	1,260	1,296	1,332	1,368
Pullets	do.	2,170	2,240	2,310	2,380	2,450	2,520	2,604	2,688	2,772	2,856	2,940	3,024	3,108	3,192
Hens and pullets	do.	3,100	3,200	3,300	3,400	3,500	3,600	3,720	3,840	3,960	4,080	4,200	4,320	4,440	4,560
Pullets raised	do.	2,240	2,310	2,380	2,450	2,520	2,604	2,688	2,772	2,856	2,940	3,024	3,108	3,192	3,276
Death loss, layers	do.	589	576	660	680	700	792	744	730	792	775	756	950	977	912
Death loss, percentage of January 1 numbers	Percent	19	18	20	20	20	22	20	19	20	19	18	22	22	20
Layers used on farm	Number	50	50	50	50	50	50	50	50	50	50	50	50	50	50
Layers sold	do.	1,501	1,584	1,570	1,620	1,670	1,642	1,774	1,872	1,894	1,995	2,098	1,988	2,045	2,194
Price received per layer sold	Dollar	.74	.76	.77	.84	.69	.62	.70	.62	.62	.46	.52	.45	.40	.42
Receipts from layers sold	do.	1,111	1,204	1,209	1,361	1,152	1,018	1,242	1,161	1,174	918	1,091	895	818	921
Average number of layers on hand during year	Number	2,108	2,163	2,746	2,757	3,272	3,478	3,508	3,421	3,505	3,635	3,700	3,940	4,063	4,104
Percentage of January 1 numbers	Percent	68	68	83	81	94	97	94	89	89	89	88	91	92	90
Egg production per layer on hand during year	Number	172	179	179	185	186	185	187	191	191	188	189	192	195	194
Total egg production	Dozen	30,215	32,263	40,960	42,502	50,714	53,617	54,664	54,449	55,786	56,946	58,273	63,037	66,024	66,348
Eggs used on farm	do.	160	160	160	160	160	160	160	160	160	160	160	160	160	160
Eggs sold	do.	30,055	32,103	40,800	42,342	50,554	53,457	54,504	54,289	55,626	56,786	58,113	62,877	65,864	66,188
Price received per dozen eggs sold	Dollar	.42	.45	.56	.59	.52	.45	.54	.47	.53	.40	.44	.41	.39	.40
Receipts from eggs sold	do.	12,623	14,446	22,848	24,982	26,288	24,056	29,432	25,516	29,482	22,714	25,570	25,780	25,687	26,475
Egg sales, percentage of total cash receipts	Percent	92	92	95	95	96	96	96	96	96	96	96	97	97	97
Total cash receipts	Dollar	13,734	15,650	24,057	26,343	27,440	25,074	30,674	26,677	30,656	23,632	26,661	26,675	26,505	27,396
Land in farm	Acre	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Cropland harvested	do.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Index numbers (1947-49 = 100):															
Gross farm income	Percent	54	61	93	102	105	97	118	103	118	92	103	103	103	107
Net farm income	do.	36	26	83	96	121	56	113	37	113	-15	55	39	36	45
Net farm production	do.	59	67	88	95	117	122	126	127	129	129	132	144	153	153
Rate of lay	do.	94	98	98	101	101	101	102	104	104	103	103	105	106	106
Production per hour of man labor	do.	66	74	90	97	113	114	120	122	125	124	129	142	153	153
Production per unit of input	do.	88	91	97	99	104	104	105	105	105	104	105	107	109	109
Operating expenses per unit of production	do.	84	95	103	107	90	90	97	100	96	96	89	87	83	84
Total cost per unit of production	do.	87	97	103	106	91	90	97	101	97	98	92	90	88	90
Power and machinery, January 1	do.	100	100	99	100	101	103	106	112	121	131	140	151	155	160
Prices received for products sold	do.	77	82	101	106	93	81	97	84	94	71	78	73	69	71
Prices paid, including wages to hired labor	do.	77	89	101	107	92	93	101	105	100	99	94	92	90	90

TABLE 6.--Farm expenses, labor and capital used, net returns, and related data, commercial family-operated poultry farms, New Jersey, 1945-58

Item	Unit	1945	1946	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958
Cash receipts	Dollar	13,734	15,650	24,057	26,343	27,440	25,074	30,674	26,677	30,656	23,632	26,661	26,675	26,505	27,396
Cash expenses	do.	12,726	15,352	20,549	22,165	21,803	23,274	25,778	26,424	25,915	26,475	25,410	26,484	26,513	26,955
Feed purchased	do.	9,547	11,858	16,474	17,611	16,973	18,243	20,243	20,611	19,970	20,455	19,227	20,019	20,025	20,219
Baby chicks	do.	751	801	849	983	1,042	1,058	1,112	1,235	1,272	1,290	1,368	1,445	1,483	1,564
Other poultry expense	do.	277	284	374	386	469	498	522	523	539	551	554	599	622	646
Power and machinery expense	do.	387	426	499	563	612	630	680	746	792	764	757	779	813	826
Brooder fuel	do.	90	92	95	98	126	130	134	139	143	176	181	186	192	197
Farm building expense	do.	637	705	924	1,049	1,065	1,111	1,372	1,441	1,477	1,549	1,647	1,779	1,748	1,821
Labor hired	do.	676	788	887	994	996	1,054	1,135	1,128	1,095	1,038	1,002	975	900	928
Taxes	do.	156	168	182	196	210	224	242	258	277	296	316	336	356	376
Telephone	do.	14	15	16	18	19	21	22	23	24	25	26	28	30	32
Electricity	do.	141	163	182	198	211	220	227	231	234	234	232	230	232	230
Insurance	do.	8	9	12	14	15	16	19	21	22	24	26	29	32	34
Miscellaneous expense	do.	42	43	55	55	65	69	70	68	70	73	74	79	80	82
Net cash farm income	do.	1,008	298	3,508	4,178	5,637	1,800	4,896	253	4,741	-2,843	1,251	191	-8	441
Total labor used	Hour	5,300	5,360	5,790	5,810	6,110	6,300	6,180	6,140	6,050	6,140	6,020	6,000	5,900	5,900
Operator and family labor	do.	4,100	4,080	4,430	4,370	4,590	4,700	4,660	4,700	4,700	4,870	4,830	4,900	4,900	4,900
Hired labor	do.	1,200	1,280	1,360	1,440	1,520	1,600	1,520	1,440	1,350	1,270	1,190	1,100	1,000	1,000
Hired labor, percentage of total	Percent	23	24	24	25	25	25	25	23	22	21	20	18	17	17
Total farm capital, January 1	Dollar	22,140	24,180	29,310	31,660	34,100	33,320	35,600	39,880	40,930	41,900	42,060	46,030	48,940	52,350
Land and buildings	do.	15,880	17,650	21,330	23,060	24,150	24,730	27,210	29,970	31,270	32,560	34,160	37,220	40,500	43,180
Machinery and equipment	do.	840	830	980	1,120	1,230	1,250	1,320	1,460	1,540	1,590	1,600	1,680	1,780	1,870
Livestock	do.	5,420	5,700	7,000	7,480	8,720	7,340	7,070	8,450	8,120	7,750	6,300	7,130	6,660	7,300
Value of perquisites	Dollar	624	676	767	788	802	781	832	910	946	937	965	1,030	1,109	1,191
Change in inventory:															
Livestock	do.	178	212	220	249	204	228	264	246	228	180	198	180	192	192
Machinery and buildings	do.	326	354	459	514	525	545	736	793	824	821	859	925	834	869
Net farm income	do.	2,136	1,540	4,954	5,729	7,168	3,354	6,728	2,202	6,739	-905	3,273	2,326	2,127	2,693
Charge for capital	do.	886	967	1,172	1,266	1,534	1,499	1,602	1,795	1,842	1,886	1,893	2,209	2,692	2,932
Return to operator and family labor	do.	1,250	573	3,782	4,463	5,634	1,855	5,126	407	4,897	-2,791	1,380	117	-565	-239
Return per hour in current dollars	do.	.30	.14	.85	1.02	1.23	.39	1.10	.09	1.04	-.57	.29	.02	-.12	-.05
Index of family living items[1]	Percent	147	163	191	202	196	198	216	218	217	227	220	224	230	232
Purchasing power of return to labor in 1937-41 dollars	Dollar	850	352	1,980	2,209	2,874	937	2,373	187	2,257	-1,230	627	52	-246	-103

[1] 1937-41 = 100

The care of the replacement flock requires considerable time, particularly during the first few weeks. Few poultrymen have mechanized the feeding of their replacement flocks, but the watering is usually automatic, and gas and electricity have largely replaced the coal stoves in most brooder houses.

Most of the commercial egg producers in New Jersey and many in other parts of the Northeast buy their entire feed requirements. The farms typically contain only a few acres, many of them on light sandy soils, so crops are seldom grown. Sometimes a few garden vegetables are raised.

In New Jersey, poultry buildings are usually one-story structures. Conventional frame construction is most popular, but cinder block houses are seen occasionally. Most floors are of concrete. Metal and composition are the common roofing materials. An average of about $3\frac{1}{4}$ square feet per bird on hand (as an average during the year) is usually provided, or about 3 square feet per bird when the laying flock is at its seasonal peak around the first of the year. By the late forties, egg cleaners and washers and automatic egg graders were commonly used on these farms, and automatic feeders have been installed on most of them since 1950.

Table 5 shows the layers on hand the first of each year, and the production and disposition of birds during the year. The light breeds, chiefly White Leghorns, are commonly used for egg production, as they are more efficient layers. Very low prices are received for cull layers, so the extra weight of the heavier birds is only a slight advantage when they are sold as culls.

Although the use of started pullets is not unknown in the area, replacements are usually bought as sexed chicks. Enough chicks must be raised during the year to replace death losses in the laying flock, to take the place of those sold and eaten, and for any increase in size of flock. After their first year of production, older hens do not lay as well as the younger ones. For this reason, most hens are replaced early in their second year of production, and usually all of them are culled out before the end of their second year.

About two-thirds of the pullets raised are usually required to replace the older birds sold, and an additional fourth is needed to replace death losses in the laying flock.

Better breeding, feeding, and management has brought about a 13-percent increase in the rate of lay since 1945. Egg production per average layer on hand during the year has gone up from 172 in 1945 to 194 in 1958.

The important trends of the 1945-58 period on commercial poultry farms in New Jersey can perhaps best be summarized in figures 9, 10, 11, and 12. All data are in percentages of 1945.

Together, figures 9 and 10 show the important factors that determine the total value of eggs sold per farm. Figure 9 shows the number of layers and the rate of lay which multiplied together give the total egg production. The important point brought out in figure 9 is that the expansion of egg production is due mainly to the larger number of layers in the flock, with a modest assist from the increased rate of lay. This egg-production line is then repeated in figure 10, where, together with the price per dozen, it determines the value of eggs sold.[9] Here, the significant facts are the similarity in the year-to-year changes in prices and in total sales, and the way in which a generally upward trend in production since 1948 is virtually offset by a generally downward trend in price, to give total sales that fluctuate about the level of 200 to 210 percent of 1945.

Purchased feed makes up about three-fourths of the total cash expenses on these poultry farms. It varies more in price from year to year than do such purchased items

[9] After allowing for the 160 dozen eggs used on the farm each year.

as baby chicks, brooder fuel, or litter. Feed costs, therefore, are mainly responsible for the year-to-year variations in the total expenses of these poultrymen. Figure 11 shows the changes in quantity of feed bought, in price, and in total feed expenses, all as percentages of 1945. Since 1951, a steadily increasing quantity is offset by a downward price trend to give a level of feed expense only slightly more than double that of 1945.

Figure 12 summarizes the trends shown in figures 9, 10, and 11. The difference in the height of the bars shows the amount of each year's gross income required to pay for all cash inputs used in that year: including nonfeed items (not shown in figure 11). Note the variation in net farm income[10] --the good years of 1947, 1948, 1949, 1951 and 1953, and the particularly poor year of 1954.

Today's commercial poultry farm is a considerably more efficient operation than that of the immediate postwar period. The increase in the size of flock and its more uniform size throughout the year have contributed part of this increased efficiency. Mechanization has made it possible to handle the larger flock without a proportional increase in the labor force. The index of production per hour of man labor jumped from 66 in 1945 (1947-49=100) to 153 in 1958, while the index of power and machinery went from 100 to 160 in the same period (table 5). A more general measure of efficiency is the index of production per unit of all inputs, which increased from 88 in 1945 to 109 in 1958. The higher rate of lay was reflected in a lower feed requirement per dozen eggs, which dropped from 7 to about 6.4 pounds per dozen.

The fact that efficiency of production has increased does not mean that the production has become more profitable, as the recent downward trend in net farm income indicates. Efficient production helps, but no egg producer is so efficient that he can afford to ignore the price of eggs. In 12 of the 14 years of this series, sales of eggs have made up 95 percent or more of the total cash receipts on these commercial poultry farms (table 5). Small changes in the price of eggs can produce much larger percentage changes in net farm incomes. For example, if we take the 66,348 dozen eggs produced in 1958 as a basis, a 1-cent (about $2\frac{1}{2}$ percent) difference in the price would have made a difference of about $660 in net income in that year.

But feed prices are important too. They make up three-fourths of the total cash costs on these farms. Again using 1958 as a basis, if the 5,085 100-pound bags of feed bought in that year had cost 10 cents more per bag, the total farm expense would have been $508 higher, and net farm income would have been reduced by the same amount.

Perhaps the relationship between egg and feed prices, on the one hand, and the net farm income of the poultryman, on the other, can best be shown by a hypothetical example. As a basis for the example, we use the same egg production, the same quantity of feed, and the same quantity of all other inputs and outputs that these New Jersey farms used or produced in 1958. We assume also the same prices received and paid as were actually received or paid in that year, except the prices of eggs and feed. We are thus in a position to assume any egg price and any feed price we wish, and by using a very simple equation, we can easily calculate the net income that would have resulted had these prices actually prevailed in 1958.

The four elements of the equation are as follows: (1) Income from eggs (eggs used are valued at the market price, so this figure consists of total production times the market price we decide to use); (2) other income (sales of cull layers, perquisites other than eggs used, and inventory changes), which for this analysis is assumed to be fixed at the 1958 level and thus is put into the equation at $3,109; (3) feed expense, which is the quantity

[10] Net farm income is the difference between cash expenses and the total of cash sales, farm products used, and the value of house rent, plus or minus change in inventory.

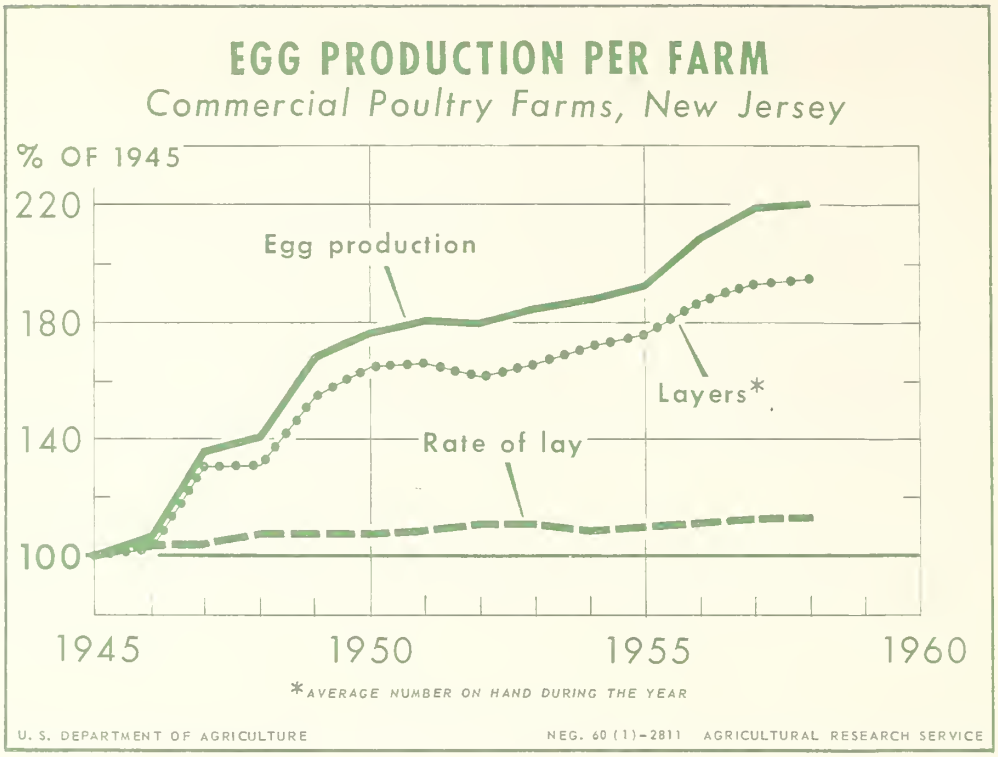

Figure 9

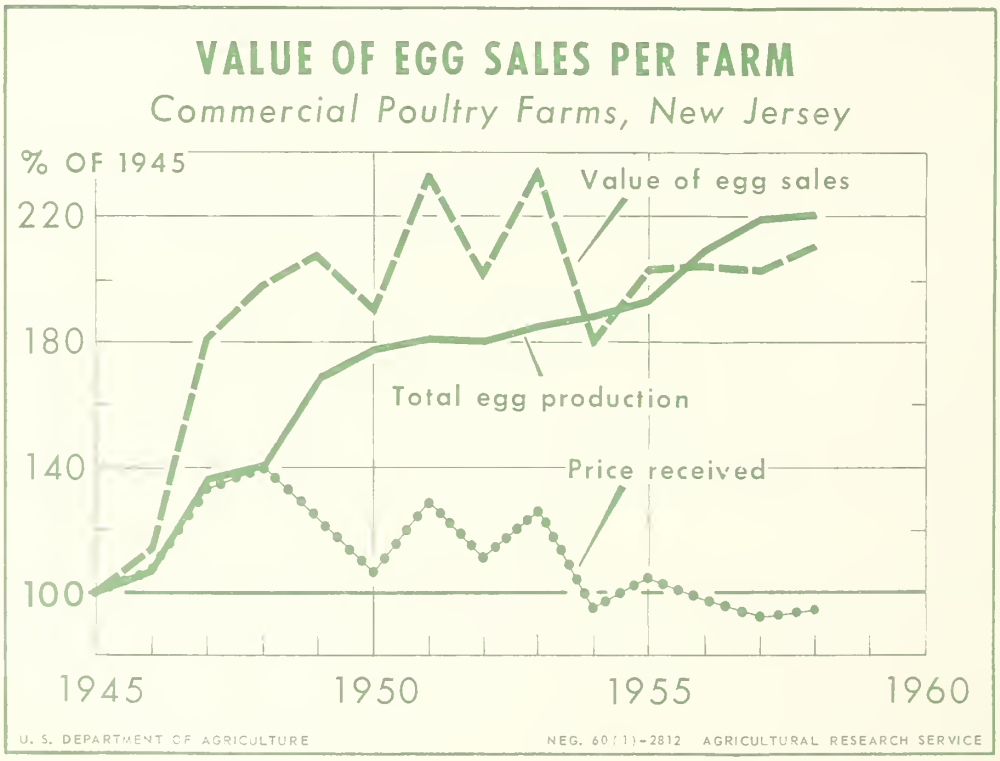

Figure 10

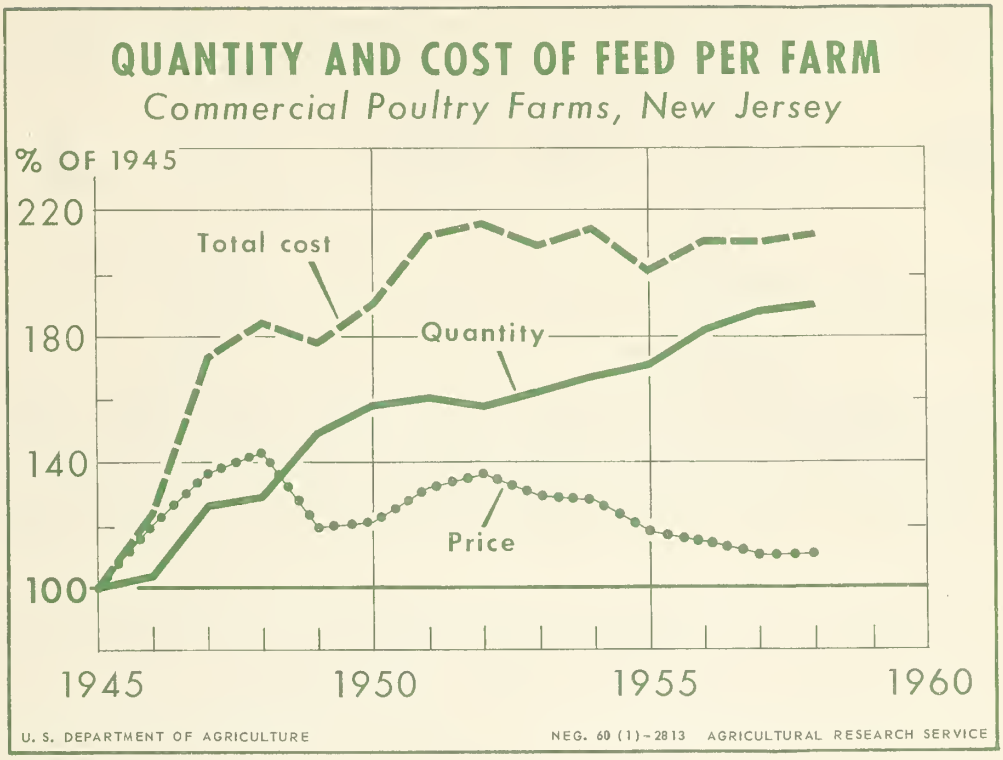

Figure 11

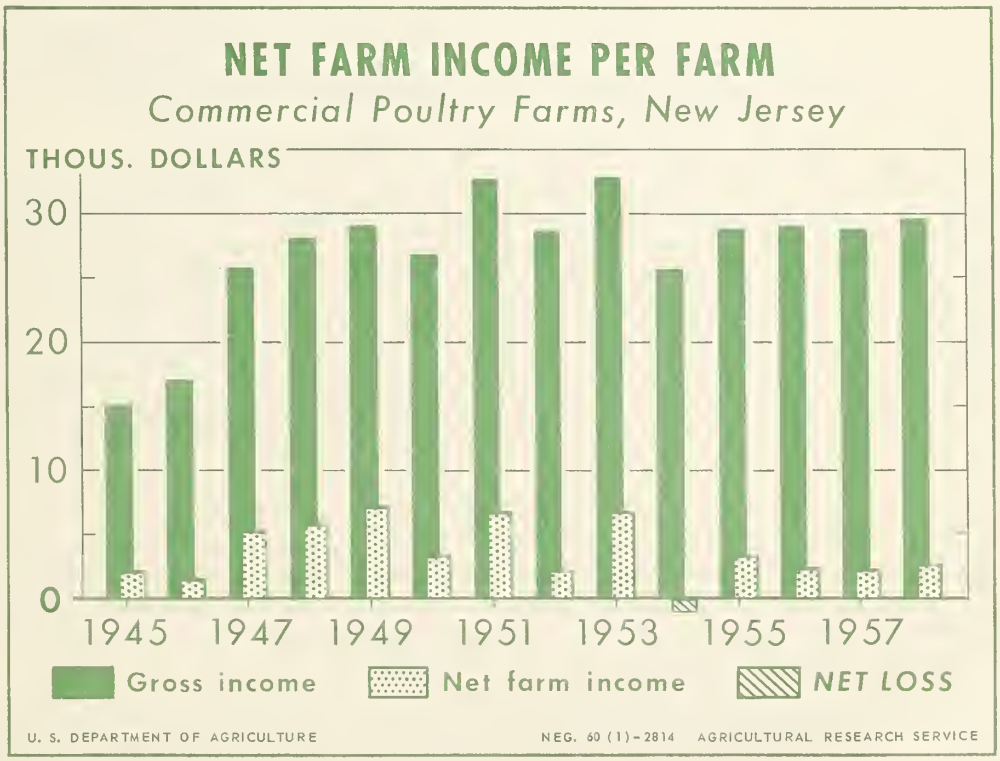

Figure 12

of feed used in 1958 multiplied by the feed price we decide to use; (4) other expenses, which we set at the actual 1958 total of $6,736. Net farm income can be calculated by adding items 1 and 2 and from this total subtracting items 3 and 4, thus:

[Eggs produced, doz.	X	Price of eggs]	+	Other income	-	[Feed bought, 100 lbs.	X	Price of feed]	-	Other cash expense	=	Net farm income

or,

[66,348	x	Price of eggs]	+	$3,109	-	[5,085	x	Price of feed]	-	$6,736	=	Net farm income

Determination of the net farm income that would have been received by our "representative poultryman" at various assumed levels of egg and feed prices may more conveniently be made graphically from figure 13. For example, to find the net farm income that would result with 40-cent eggs and $4 feed (to use figures that closely approximate actual 1958 figures), we draw a line straight up from the 40-cent point on the horizontal (egg-price) scale, and find that it intersects the $4 feed-price line at about the $2,600 income level.

Net income that would have resulted with other price-cost conditions may be determined similarly. For example, with the somewhat more favorable combination of 44-cent eggs and $4 feed, the net income figure comes to about $5,200.

If a large part of the year-to-year variations in the poultryman's net farm income is due to changes in egg prices, and another large share is due to changes in feed prices, the relationship of egg prices to feed prices will explain more of the income changes than will either price series alone. This is suggested by the close relationship of net farm income and the egg-feed price ratio shown in figure 14. However, the absolute levels of both egg and feed prices also affect net farm income. For example, an egg-feed price ratio of 10 produces a higher income with 50-cent eggs and $5 feed than with eggs at 40 cents and feed at $4. This is indicated by the upward slope of the lines in the right hand section of figure 13.

Nevertheless, with a group of farms such as this, the egg-feed price ratio is a good single determinant of year-to-year changes in net farm income. Under the conditions that prevailed on these farms in the 1945-58 period, for each point added to the egg-feed price ratio net farm income tended to rise by nearly $2,000. This is indicated in figure 15 by the heavy diagonal line, which is called the "line of average relationship" of net farm income to the egg-feed ratio. The broken lines above and below this line mark off the band within which one would expect two-thirds of the years to fall (10 of the 14 do so fall). In two-thirds of the years we would expect the net farm income on these farms to be within (plus or minus) about $1,300 on the basis of the egg-feed ratio. The accuracy of this method of estimating net farm income would be improved by making additional adjustments for size of business and rate of lay. Also the level of egg and feed prices, as distinct from their ratio, is important, as pointed out above.

It will be noticed that the years that deviate most from the line of average relationships are 1945 and 1946. These were the last 2 years in which production of only one lot of replacement birds was common in the area. From 1947 on, the number of layers on hand was more nearly uniform throughout the year, thereby permitting more effective use of production facilities and labor. This is perhaps the main reason for the closer relationship between income and the egg-feed price ratio from 1947 on.

On the basis of the more homogeneous period of 1947-58, the relationship is somewhat more exact. In view of the fact that fixed resources were used to more nearly the same degree of intensity (number of birds handled with given building and equipment facilities), this is to be expected. When a line of average relationship is fitted to the data for 1947-58

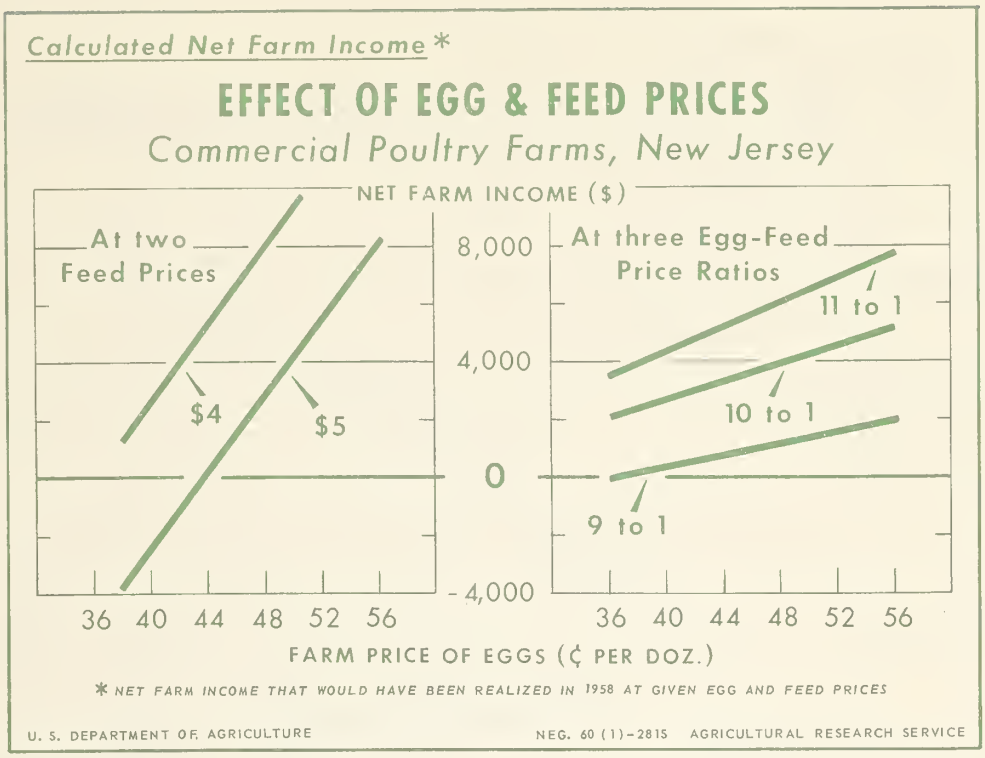

Figure 13

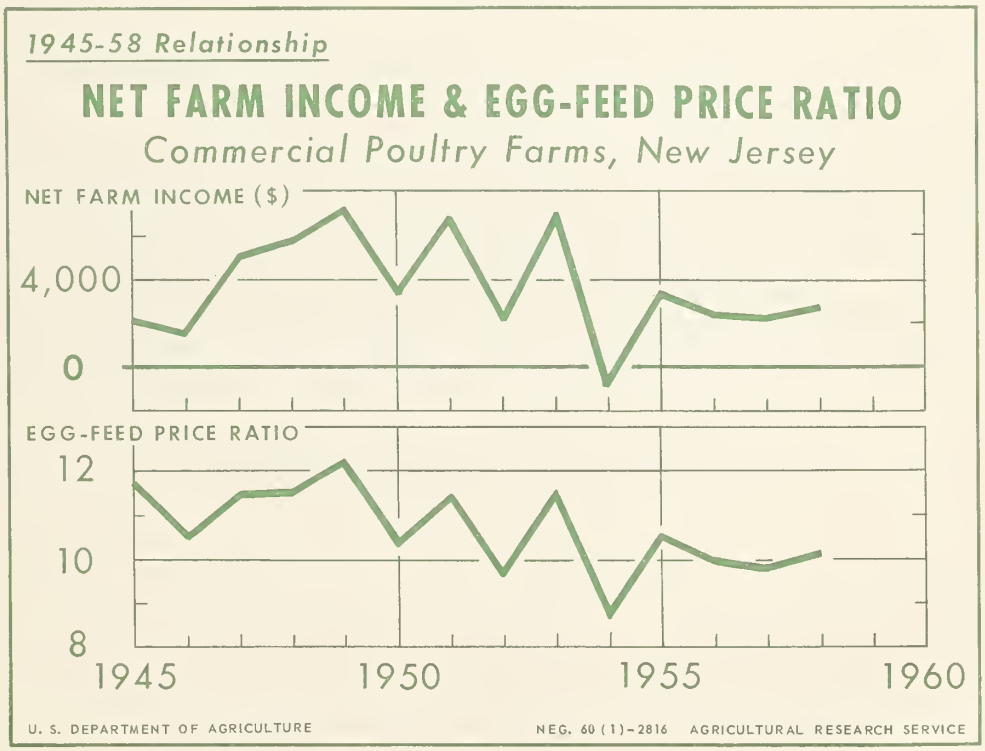

Figure 14

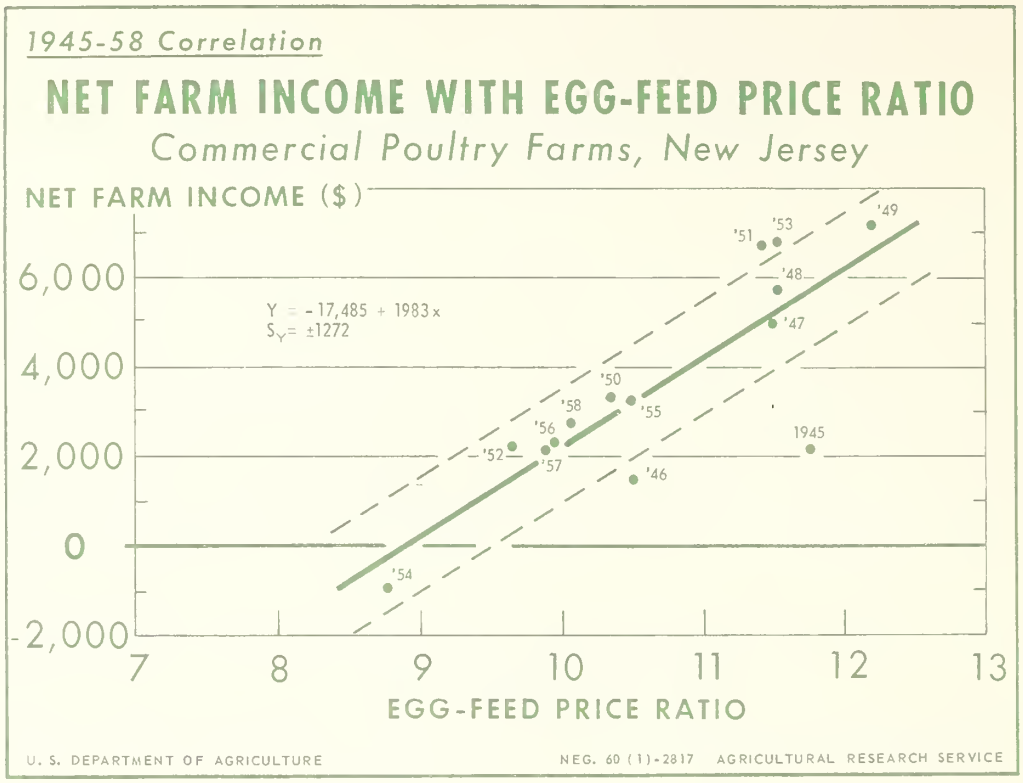

Figure 15

(instead of 1945-58) the "fit" is a closer one. For two-thirds of this period, on the basis of the egg-feed price ratio alone, we can predict the net farm income within about (plus or minus) $518.

Commercial egg production is a highly competitive business which involves a considerable element of risk. The risk is due partly to the inelastic nature of the demand for eggs.[11] When consumer demand is inelastic, small changes in production generate relatively large changes in prices received by the producer. Also, as pointed out, even small changes in prices received for eggs exert considerable "leverage" on the net incomes of poultrymen, unless they are offset by changes in the price of feed. Add to this basis for instability the generally depressing effect of a gradual upward trend in egg production, and a decline in the domestic per capita consumption of eggs. The result is a series of net incomes that fluctuate about a level that is considerably below that prevailing in the late forties.

[11] See, for example, Gerra, M. J. An Econometric Model of the Egg Industry. Jour. Farm Econ. 41(2): 284-301. May 1959.