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Relative Profitability of Alternative Procurement, Production, and Selling Programs for Broiler Processors

Based on Studies in the New England Area, 1957-59

Economic Research Service
Marketing Economics Division
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PREFACE

In the intensely competitive environment in which they operate, managers of broiler processing plants are continually seeking ways to operate at a profit. Recent studies have provided guidelines for improving the efficiency of assembling and processing operations. Application of such recommendations will aid managers in reducing costs and improving their competitive position. In some instances where processing is done by cooperatives, direct benefits from lower processing costs would accrue to grower-members. Growers would also benefit to the extent that private processing firms used savings from increased efficiency as a basis for improving their competitive position by increased payments to growers.

This study evaluates, in terms of net returns at the processing level, some of the procurement, production, and selling programs plant managers can select. It also describes a method whereby plant managers can test the validity of the conclusions reached in this report against their present environment, or make periodic reevaluations as costs, prices, and structural relationships in the industry change. While this report is based on data from studies in the New England area, results are probably applicable to other areas to a large extent.

This study is part of a broad program of research conducted by the U. S. Department of Agriculture to improve the efficiency of marketing agricultural products.

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SUMMARY

For about a decade after the end of World War II, the commercial broiler industry was able to expand output every year and to sell its output at profitable prices. New technology in producing, processing, and marketing made it possible for the industry to profit while consumers benefited from lower prices.

As the capacity of the industry expanded further, however, periods of unduly depressed or unprofitable prices occurred. Most of these periods were in the fall and winter when the demand for fresh-killed broilers declined.

Much of the postwar expansion of the commercial broiler industry has been predicated on contract growing. In many of these programs the processing plant is a participant, resulting in closer coordination of growing and processing and in the decline of independent growers as sources of live birds. However, when losses have occurred on growing operations, processors have frequently questioned the advisability of participation or have sought to cut back output in some seasons. Yet processing costs are lowest when plants are operated at capacity, and there are substantial economies in large-scale assembling and processing. Likewise, costs of growing are lowest and total returns highest when resources are used to capacity. The inability of the industry to sell its entire output in fresh-killed form at profitable prices has heightened interest in seeking new outlets for frozen and prepared forms.

The programs of procurement, plant output, and selling used by poultry processors are affected by environmental factors and by short-run competitive goals. But the diverse reactions of processors to these and other forces suggested a need for an objective evaluation of the relative profitability of alternative programs for the long run. The evaluation presented in this report was accomplished by a budgetary approach using standardized cost and volume assumptions within a market price framework. Data are for New England but probably fit conditions in other areas fairly well.

Under the price and cost relationships in this study, direct contracting between the plant and the grower was the most profitable method of procurement, and buying broilers live on the open market was the least profitable. Three-way contracting and a combination of buying on the open market and direct contracting fell between the two extremes. Market prices of live broilers and costs of growing varied seasonally, and inversely.

It would pay individual plant operators to operate at capacity rather than to try to vary volume with seasonality of demand and prices. Operators may need to use other market classes to supplement supplies of broilers which vary seasonally. Capacity operation on broilers alone may be open to few firms if output is sold entirely as fresh-killed whole or cut-up broilers. It would be more generally applicable if some net increase in consumption were made possible by selling the additional quantities in frozen or prepared forms.

Additional costs would be incurred in selling broilers in frozen or prepared form. These costs would need to be recovered in selling prices. However, frozen and fresh whole or cut-up broilers are likely to be directly competitive if frozen volume is increased substantially. A few processing firms could increase their net returns by storing part of fall and winter output for later sale. But, if this practice became general, spring and summer prices would be depressed while fall and winter prices rose, and net returns would drop below what could be realized by selling from current output.

If plants are to operate at capacity and minimize costs, they will need to divert their additional output to new and generally noncompetitive products, especially from September to December. Development of new products and new outlets for them could raise fall and winter prices for all firms.

The market for fresh-killed broilers represents a preferred position since broilers are conveniently packaged, can be prepared quickly and easily in a variety of ways, and are attractively priced in relation to most competing meats. Hence, the industry should not abandon this market, but rather sell a larger share of its output in other forms. This study shows that the poultry industry could do better if it were less wedded to the chilled fresh broiler as its staple item of commerce. If more emphasis could be placed on selling the product in other forms, lower costs and higher net returns might be achieved, particularly during the final quarter of each year.

Realization of increased net returns to processors through altered selling methods would require changes in market structure. Basically, closer coordination of the processing and distributing functions would be needed.

RELATIVE PROFITABILITY OF ALTERNATIVE PROCUREMENT, PRODUCTION, AND SELLING PROGRAMS FOR BROILER PROCESSORS

Based on Studies in the New England Area 1957-59

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BACKGROUND AND OBJECTIVES

Various long-range possibilities for increasing net returns from growing, processing, and selling broilers were explored in the study reported here. While the methodology used expresses potential net returns at the processing level, it does not imply how gains will be distributed. Indeed, growers, processors, and others engaged in marketing broilers can all gain from long-range increases in net returns. Many growers are members of cooperative organizations engaged in processing and selling broilers. These growers can benefit from savings through higher prices and patronage refunds. The close coordination which has developed in the broiler industry between growers, feed dealers, hatcheries, and processors should make obvious the need for each segment to receive proper consideration for the costs and risks involved.

Among the decisions which must be made by plant management are those concerned with obtaining live birds, setting operating levels for the plant, and picking the time and form in which to sell the products. Most of the recent economic studies relating to broiler growing, assembling, and processing have been directed toward increasing efficiency and reducing operating costs. While operating efficiency is of constant concern to plant management, it is only one factor in determining plant returns. Marketing programs and prices received are also of major importance.

The technological revolution which produced the modern broiler industry has brought new problems for management. The tremendous capacity of the industry to produce year-round at low costs has resulted in intensified competition and declining prices. In some recent years, prices of live birds and fresh ready-to-cook broilers have been depressed or unprofitable for long periods. Moreover, despite some cutbacks in fall and winter output, the decline in demand for broilers in these months usually results in the lowest prices of the year. In this environment, there is mounting pressure to reduce the cost per unit of output, to find an optimum production schedule, and to seek new outlets in frozen and further-processed forms. 1/

In the last decade, improvements in breeding, feeding, and management have made production more efficient. New methods of assembling, processing, packaging, and distributing have reduced costs, improved quality, and made large-scale operations feasible. Numerous changes in the structure of the industry have facilitated the widespread adoption of the new technology. Extensive use of contract growing and production financing have accompanied the rise of new broiler areas and expansion in some older areas. As competition has intensified, many firms have sought further

1/ Ready-to-cook broilers are sold whole or cut-up in both fresh and frozen forms. Further-processed forms include such items as canned chicken; chicken a la king; frozen croquettes; frozen chicken pies and dinners; and various other freshly cooked, frozen, or canned foods in which chicken may be only one major ingredient.

cost reductions through the integration of growing and marketing under common management. Others have sought closer coordination of these functions through less formal means.

Integration increases the overall efficiency of the industry by reducing risks and variability. It reduces costs by eliminating uncertainties and matching the outputs of parts of the integrated firm. It stabilizes employment of labor. It helps to develop adequate markets by assuring supplies of constant quantity and quality (17, pp. 1491-93). By stabilizing output it can simplify decision-making for management; this may be of greater appeal as the number of functions in the organization increases.

The existence of economies of scale, particularly in assembling and processing broilers, has resulted in fewer and larger firms. The substantial investment required by a large-scale enterprise has focused increased attention on the need for operating at a high percentage of capacity. On this matter the interests of growers, assemblers, and processors run parallel. Growers, like marketing firms, can minimize costs by near-capacity operation of units of optimum size. Stability of volume at near-capacity levels and vertical integration have become closely associated in our thinking, as the following paragraph illustrates:

> "Processors of farm products, faced with changes in the requirements of retailers and wholesalers, use contracts with farmers and farmer-cooperatives to assure adequate and timely supplies of specific quality. But, they also benefit directly by using contracts and other forms of integration to build volume and stabilize supplies in order to reduce unit costs and increase profits. It is costly for expensive equipment to be under-used, and intermittent layoffs disrupt work morale and increase labor costs" (20, p. 3). 2/

Despite these apparent advantages of stabilizing output at a high percentage of capacity, for both integrated and nonintegrated firms, certain other factors must be considered. Management may be motivated to depart from such a program for one or more of the following reasons:

(1) All uncertainty about outlets and price variations has not yet been eliminated. Large-volume distributing firms are not generally units of an integrated organization. While some distributors have informal understandings with processors, these involve no binding commitments on quantity or price. Indeed, their requirements may vary from season to season and week to week, and the use of broilers as "specials" may materially affect both price and quantity. Moreover, in a situation of uncertainty, processors may be highly concerned with such short-run objectives as maintaining a share of the market, their outlets with particular firms, or their inventory position.

(2) The demand for broilers varies seasonally. July and August prices are often among the highest of the year, despite the peak in marketings at that time. In contrast, November and December broiler prices usually are among the lowest of the year, partly because of competition from turkeys during the holidays. Seasonal changes in slaughter reflect the response of many firms to these situations.

(3) Not all market classes are available in all seasons. Many poultry-slaughtering plants handle other market classes of poultry such as fowl, roasting chickens,

2/ Underscored numbers in parentheses refer to items in the Literature Cited, p. 25.

turkeys, and specialty items. Supplies of many of these classes vary seasonally, but not exactly in inverse relationship to supplies of broilers. For example, fowl are available in greatest volume in many areas during the late summer and fall.

(4) Because the integrated organization is a relatively recent type, management may not be reconciled to viewing it as an entity. Rather than measuring performance in total terms, management may be preoccupied with the profit-and-loss position of each functional department. For example, if losses appear regularly on contract growing operations, the program may be cut back or another procurement program may be adopted. This may substantially raise costs of assembling and processing. Incorrect decisions can arise from failure to recognize the interaction between individual departments or to understand the contribution of each to the total returns.

(5) Many persons in management jobs are, by virtue of their background and training in earlier market situations, tempted to try to "out-guess the market." Control of substantial volumes may strengthen this tendency. If such a philosophy prevails, it can defeat the purposes of integration and the stability of operations at near-capacity levels unless management is unusually skilled at such tactics.

PROCEDURE

The ultimate test of performance can be found in the potential net returns from alternative programs which plant management can select. In this report, a number of feasible alternatives were selected from data on the procurement and production programs of poultry processors in New England and from other sources. 3/ These alternatives were analyzed by the budgeting technique. The analyses make use of growing, assembling, and processing costs and of input-output relationships from previous studies in the New England area. They are accomplished within a framework of actual average market prices in that region during the period 1957-59.

Use of standardized volume levels, assembling and processing costs for plants of various capacities, growing costs, live-market prices, and ready-to-cook prices (or their equivalent values at the plant level) offers a suitable method for evaluating the potential net returns from various procurement, production, and selling programs. The results obtained herein, under the assumptions made, indicate the direction of best long-range adjustments rather than absolute returns actual plants can expect. Using this methodology individual firms, by substituting data pertinent to their situation, can readily determine (1) the degree to which adjustments suggested in these analyses apply to them, and (2) reasonably accurate projections of actual returns they can expect from various programs as costs, prices, and structural relationships in the industry change.

The method used is designed to measure combined net returns from production, assembling, and processing. The efficiency of these individual functions is, and should be, of concern to management. However, management should be guided more by the overall profit-or-loss position than by the profit or loss in individual departments.

Just as the overall net returns should outweigh the results from each department, so should the annual results be more important than results in individual months

3/ Rogers, G. B., and Bardwell, E. T. Procurement Programs and Stability of Volume in New England Poultry Processing Plants. Draft report prepared under cooperative project of Econ. Res. Serv. and N. H. and Mass. Agr. Expt. Stas. October 1958.

or weeks. Short-term results are important, but they should not be the sole basis for deciding the merits of alternative procurement, production, or sales programs. To simplify computations, net returns were calculated only on a monthly basis for this report.

A realized net return above all fixed and variable costs is a legitimate component of marketing margins. In the long run, a return above corporation taxes represents capital necessary to expand the existing organization or to develop new enterprises, whether management retains control of the surplus or distributes it to shareholders. In the short run, a potential net return above a normal rate on investment or transactions can be used to undersell other firms. It can also be used to increase the returns to growers and other participants in production and marketing.

This study shows possible economies in growing, assembling, and processing. Additional economies may be realized by combining hatching, feed milling, distribution of feed and chicks to farms, and distribution of processed poultry to retailers, within an integrated organization. If economies of scale and combination exist, they would further enhance the position of larger organizations. Studies to appraise these additional economies are being conducted under cooperative arrangement between the Economic Research Service and the New Hampshire and Massachusetts Agricultural Experiment Stations.

PROCUREMENT, PRODUCTION, AND SELLING PROGRAMS OF NEW ENGLAND BROILER PROCESSORS

Operating in a nationwide market for broilers, New England poultry processors face most of the same selling problems as firms in other regions. However, within New England there are substantial differences in the degree of commercialization of production, the market classes of poultry available, and the type of procurement arrangements.

Many of the decisions made by plant managers are based on short-run goals. Since these goals differ from plant to plant, depending on individual circumstances, little consistency in behavior can be observed in a survey. However, a survey is useful in identifying some of the procurement, production, and selling programs followed by broiler processors. These can then be used in an analysis where conditions are standardized and the object is to test long-range programs.

Procurement Programs

Poultry-processing plants in New England obtained supplies of live poultry from five sources in 1957 (table 1):

(1) Purchases from independent, unintegrated suppliers, such as growers, live buyers, and other processors.

(2) Purchases from independent contractors. These persons or firms are not engaged in producing and selling chicks or feed or in processing poultry. They organize and manage contract growing programs solely for the profit they can gain between payments to their contract growers and prices they receive from processing plants.

Table 1.--Principal procurement programs used by 23 New England poultry-processing plants, 1957

Area	Independent suppliers	Independent contractors	2- and 3-way contracts	Direct contracting programs 1/
	Plants	Plants	Plants	Plants
Maine	--	--	--	8
Connecticut	4	1	--	--
New Hampshire, Vermont, and Massachusetts	4	2	2	2

1/ Includes minor proportion grown on farms owned by integrated firms. Unpublished data. G. B. Rogers, Econ. Res. Serv., and E. T. Bardwell, New Hampshire Agr. Expt. Sta.

(3) Two- or three-way contracts with feed companies and hatcheries. Growers are usually paid a minimum rate per unit plus a share of any profits. The remaining profits or all losses are usually shared equally by the processor, feed dealer, and hatchery.

(4) Direct-contract growing programs carried on by the plants or by corporate affiliates. Growers are paid specified rates of return for the labor and other inputs they provide. Bonuses are paid for high efficiency. Remaining profits or all losses are borne by the plant or its affiliates.

(5) Farms owned by the plants or by corporate affiliates.

Independent growers and live buyers furnished virtually all of the fowl and turkeys, but most of the broilers came from contract growers.

In practice, 16 of 23 plants used 2 or more sources of supply for young chickens. Table 2 shows the extent of use of each source. The diversity of programs used, while partly a function of the area in which the plant was located, also indicated some uncertainty on the part of processors as to the best program to follow.

The possible continuity of procurement programs, their relationship to costs, and the degree of control obtained by the processing firm are of considerable long-range importance. Processors can achieve maximum continuity of arrangements by owning the supply sources. Similarly, volume available per unit, control over production and marketing decisions, and unanimity of interests of participants are maximized when the processor owns the supply sources. However, capital limitations and institutional factors may prevent extensive ownership of supply sources by processors.

Direct-contract growing offers only slightly less opportunity for processors to exercise control since the growers retain very limited decision-making power. In two- and three-way contracting, processors have less control, but some interdependency remains. When growers are completely independent, persuasion and good will, rather than control, become the basis for continued association. Table 3

Table 2.--Extent of use of alternative procurement programs for young chickens, 23 New England poultry-processing plants, 1957

Percent of supplies procured under each program	Independent suppliers	Independent contractors	2- and 3-way contracts	Direct contracting programs 1/	Total
	Plants	Plants	Plants	Plants	Plants
90 - 100	1	1	1	6	9
75 - 89	3	1	1	2	7
50 - 74	4	1	0	2	7
25 - 49	1	4	1	1	7
5 - 24	4	6	3	1	14
Total number of firms	13	13	6	12	2/ 44

1/ Includes minor proportion grown on farms owned by integrated firms.
2/ Most of the 23 plants used more than 1 source.
Unpublished data. G. B. Rogers, Econ. Res. Serv., and E. T. Bardwell, New Hampshire Agr. Expt. Sta.

Table 3.--Degree of control that broiler-processing plants can exercise over various production and marketing factors, by type of procurement program: Subjective scoring system 1/

Broiler procurement program	Continuity of arrangements	Volume available per farm	Production decisions	Marketing decisions	Unanimity of interests of participants	Total
Ownership of farms	1	1	1	1	1	5
Direct contracting	2	2	2	2	2	10
2- and 3-way contracting	3	2	3	3	3	14
Independent contractors	3	2	4	4	4	17
Independent growers	4	3	5	5	5	22

1/ The lower the score, the higher the degree of control the processing plant has over the factors involved.

shows a subjective scoring system for the processing plants' degree of control over various supply sources.

Utilization of plant capacity and stability of volume might be most easily achieved in processing plants functioning as one link in a vertically integrated system. Also, plants having semiformal working relationships with other participants could more easily achieve these objectives than plants without such arrangements.

However, in 1957 many New England plants, which were a part of highly integrated organizations, frequently subordinated utilization of capacity and stability of volume to other considerations. On the other hand, many nonintegrated firms were able, in the short run, to put together adequate procurement programs, but perhaps at some additional cost for procurement and some sacrifice in quality or uniformity of product. Similarly California processors had worked out satisfactory procurement programs short of formal integration of the growing and processing segments (9).

These adjustments do not show which procurement programs are most profitable. Preoccupation with short-run goals and a passive attitude toward procurement programs were typical of many processors. Under these conditions, use of the synthetic method offers more promise as a basis for long-range decision-making than a study of present practices.

Production Programs

To minimize operating costs per unit of output, broiler processors should (1) operate at a high percentage of annual capacity, (2) achieve a high degree of stability of operations, and (3) advantageously use various market classes. In practice, plant managers allowed output to vary from time to time. They did this because of seasonality of demand and of selling prices, and because of other factors, some of which represent short-run competitive goals.

Size of Plant and Utilization of Capacity

Economies of scale exist in both assembling and processing broilers and fowl. Savings are possible for processing plants of all sizes as utilization of capacity approaches 100 percent (15). Assemblers can also reduce their costs by operating at capacity, and by reducing the size of their supply area.

Some savings can be made if assembling and processing are combined under one management. By 1957, about 70 percent of the live poultry assembled in New England was handled by combined-function firms. This proportion is believed to be rising (16).

Detailed studies of plant costs indicated that the greatest cost advantage for large plants could be obtained on broilers rather than heavier birds. Small plants were in the best competitive position when processing heavier birds. Hence, larger plants could use fowl (or market classes of poultry other than chickens) to help stabilize volume, but should attempt to maximize supplies of broilers. Large plants could not easily obtain enough fowl for volume operation because of the smaller aggregate supply and its market seasonality (15, pp. 15-17). Small plants, with better prospects for obtaining a high percentage of volume as fowl, might do well to regard broilers as a supplement.

In practice, utilization of annual plant capacity tended to increase with size of firm. An earlier study attributed deviations from average within size groups to "differences in the emphasis on processing and on distributing at levels above wholesale in allocating employee time, in location, market classes handled, and in the extent to which management has been successful or willing to go on keeping the processing set-up operating" (14, p. 47). These factors, in addition to the absolute magnitude of plant and equipment costs, help explain the higher rate of utilization of capacity for larger plants (14, p. 48).

These findings support the decline in the number of smaller plants in New England and other areas in recent years. The small plants which remain usually procure birds from small flocks and service small outlets. Competition has become increasingly stratified into segments, one serving small-volume and another large-volume trade. The nature of cost curves for assembling and processing broilers, and of curves showing actual utilization of capacity and stability of volume for various plant sizes, suggests the division into small- and large-volume plants at a processing capacity of 1,800 broilers per hour. This analysis is concerned with the large-volume plants only.

Size of Plant and Stability of Volume

Stability of volume also tends to increase with size of plant. Figure 1 shows that greater stability of weekly volume was attained as the annual volume of both total poultry and young chickens slaughtered increased.

Coefficients of variation of weekly slaughter of fowl were low for plants in areas where fowl were plentiful. In contrast, coefficients of variation for fowl were high for large plants in Maine, which concentrated largely on young chickens. Availability of fowl seemed more important than plant size for plants processing more than 2 million pounds of poultry annually.

For plants slaughtering 2 million pounds or less of poultry annually, the coefficient of variation on fowl was lower than that for young chickens. Without exception, the reverse was true for the remaining, and larger, plants in the sample. This indicated the emphasis on fowl by small plants as the primary market class in contrast to broilers by the larger plants. Such a shift in emphasis, as plant size increased, was supported by plant cost studies.

Reasons for Variable Output

Most plants in New England, as in other regions, depend primarily on the fresh ready-to-cook market. They reduce output in fall and winter because of decreased demand and lower prices, despite the increased costs per unit of output which accompany curtailment of volume.

Aside from the consistent fall and winter adjustments, plant operators were greatly influenced by a variety of short-run considerations. Short-run considerations included (1) trying to out-guess the market; (2) maintaining inventory positions, a share of the market, or certain outlets, or attempting to expand outlets; (3) attempted product-differentiation programs involving such items as roasting birds, frozen fryers, or further-processed products; (4) preoccupation with profit-or-loss positions of individual departments; and (5) the stage of growth or financial position of the firm.

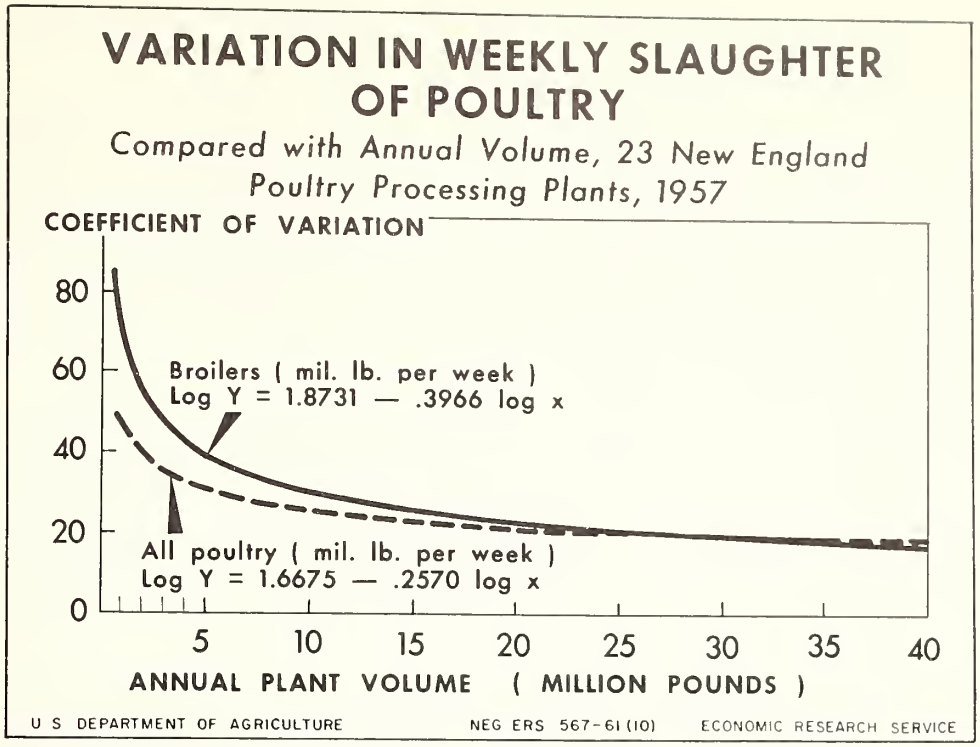

Figure 1

Many New England plants with contract growing programs stated that, as a general policy, they placed fairly constant numbers of broiler chicks on farms each week. A reason many of them gave for a regular placement schedule was that it enabled the plants to maintain their "share of the market." However, the actual performance of these plants, as measured by slaughter of young chickens, suggested this concept related more to a proportional share than to a regular or relatively inflexible quantity. In this context, a "share of the market" was not wholly inconsistent with other considerations.

Actual slaughter is probably a better measure of stability of output than broiler chick placements, both in the aggregate and for individual firms. Not only does actual slaughter bring in other market classes of poultry which are important in some sections, but it also accounts for seasonal variations in rate of growth of broilers and for the decisions of management concerning the weight per bird at slaughter. Plant managers consider market requirements and prices, present or anticipated, in deciding on early or late slaughter of broilers or their conversion to roasting chickens.

Plant costs are directly related to actual slaughter. Because of holidays and vacation periods, it is impractical for a processing plant to operate 52 full weeks without special and costly arrangements. The computed coefficient of variation of weekly plant output, with allowance only for shortened holiday workweeks, would

be 10.76. 4/ This statistic provides a yardstick with which subsequent values can be compared.

The extent to which processing plants in various New England States achieved stability of volume in 1957 is summarized in table 4. Plants in Connecticut were about as successful as plants in Maine in stabilizing output during the year. This occurred despite the higher degree of control over the broiler procurement program which Maine plants had and the greater relative importance of broilers to total volume in Maine. In comparing Maine and Connecticut with the other three States, the disparity in average volume per plant should be noted. At the size levels predominating in the three-State area, plants in those States were less successful in stabilizing volume.

The limited usefulness of aggregate data for States or larger areas in judging the performance of individual plants can be observed from table 4. For example, the coefficient of variation of weekly slaughter of young chickens for the combined plants of Maine was 12.2, the median coefficient was 22, and the range in coefficients for individual plants was 15 to 37. Coefficients of variation of weekly slaughter for the 23 New England plants were 11.7 for young chickens and 29.2 for fowl. These values were lower than the State figures or the values attained by any individual plant.

Without trying to analyze or test the intuitive ability of management to profitably juggle the plant production program in the short run, an appraisal is needed of the relative profitability of stable versus variable output in the long run, and of the role other market classes can play in maintaining plant volume and reducing costs.

Selling Programs

New England broiler processors, like their counterparts in other regions, have made substantial shifts in the form of product marketed in the past decade. In 1951, 95 percent of central Maine's poultry was sold in New York dressed form; in 1955-56, 65 percent was sold ready-to-cook (14, p. 9). By 1960, virtually all of the commercial output was ready-to-cook. Furthermore, by 1959, about 20 percent of the production of commercial plants in New England was sold in cut-up form (15, p. 8).

Commercial poultry slaughter plants in New England sold only 1 percent of their output of young chickens in frozen form in 1957, contrasted to 10 percent nationally (4, pp. 17-20). Now almost all commercial plants in the New England region have facilities for freezing available to them. Only 1 percent of the total slaughter of young chickens in the United States in 1957 was sold from plants as "prepared foods"; in New England the proportion was less than 1/4 of 1 percent.

Nevertheless, the industry shows distinct signs of committing itself heavily in the direction of product differentiation, promotion, and brand advertising. According to a recent article, based on interviews with southeastern processors, most respondents expected that further-processing would expand in the future and that more fryers would be prepackaged and frozen (19, pp. 28-43). If processors move

4/ Output is assumed to be 100% except for the weeks in which the following holidays occur: Memorial Day, July 4, Labor Day, Armistice Day, 80% each; Good Friday, 90%; Thanksgiving, Christmas, New Year's, 60% each.

Table 4.--New England poultry processing plants: Average annual slaughter, by market classes and supply sources, and degree of stability of volume, 1957

Item	Maine (8 plants)	Connecticut (5 plants)	New Hampshire, Vermont, and Massachusetts (10 plants)
Average annual slaughter per plant (mil. lbs.)	25.2	16.6	7.3
Percent of total slaughter from:			
Broilers	78	72	66
Heavy young chickens	15	12	7
Fowl 1/	7	16	25
Turkeys	2/	2/	2
Percent of total slaughter from:			
Own contract flocks	3/91	2/	16
2- and 3-way contracts	2	5	14
Other contract flocks 4/	1	23	24
Independent sources 5/	6	72	46
Coefficients of variation:			
Weekly broiler chick placements	6.7	13.7	6/
Weekly slaughter, young chickens 7/	12.2	13.6	24.8
Weekly slaughter, fowl 1/	40.0	35.5	34.2
Coefficients of variation of weekly slaughter by individual plants:			
Median value for:			
Total slaughter 8/	22	20	32
Young chickens 7/	22	23	38
Fowl 1/	83	46	55
Range of values for:			
Total slaughter 8/	18-36	15-24	22-55
Young chickens 7/	15-37	18-25	27-104
Fowl 1/	48-165	43-53	38-135

1/ Includes roosters.
2/ Less than 0.5%.
3/ Includes minor proportion grown on farms owned by integrated firms.
4/ In which plant has no financial interest.
5/ Producers, live buyers, other processors.
6/ Not available.
7/ Includes broilers, caponettes, roosters, pullets.
8/ Includes market classes other than chickens.
9/ Unpublished data, George B. Rogers, Economic Research Service and Edwin T. Bardwell, New Hampshire Agricultural Experiment Station.

toward selling in frozen form or as further-processed products, both quantities and prices may be seasonally modified. In considering such a move, processors should be aware of the possible effects on their returns and the new conditions they would have to meet to maintain their volume and income positions.

POTENTIAL NET RETURNS TO PROCESSORS UNDER ALTERNATIVE PROGRAMS

The poultry processor occupies a strategic position in the marketing process. His role is crucial in quality maintenance. He is the focal point at which prices or values are expressed which determine growers' returns and to which distributors' margins are added. Processors are frequently the coordinators, or at least vital elements, in integrated producing and marketing programs. Costs and margins incurred in growing and marketing through the delivery of processed poultry to distributors account for about 73 percent of the consumer's food dollar for fryers (6, pp. 20-22). Hence, regardless of future changes in the structure of the industry, the processor will continue to play an important role.

Commercial broilers constitute the major share of supplies of chicken meat. Thus, decision-making for most poultry processors is centered on broilers. This report concentrates on three decisions management must make: (1) The type of procurement program to follow; (2) the nature and level of plant output; and (3) the forms of product to be sold and seasonal considerations related to these products.

Procurement Programs

If processors buy live broilers on the open market from independent growers or contractors, their operating margin is wholly determined by current market forces. On the other hand, if processors participate in contract growing programs, the value of the live bird becomes a transfer price related to the cost of production, and their operating margin is affected by current market forces only at the selling end. Moreover, growing costs vary seasonally, but almost inversely with prices of live broilers. Growing costs and live prices represent the extremes of seasonal variation in live cost to the plant.

Figure 2 shows these seasonal extremes under 1957-59 average conditions. Farm values for other procurement programs would generally lie between these two alternatives. If sales were modified seasonally by most firms in the industry, the farm values reflected by the new sales pattern would also lie between the extremes. The present seasonal pattern of farm prices is largely a reflection of the U. S. pattern of commercial slaughter of young chickens, which is shown in figure 3.

Four methods of obtaining broilers were selected for analysis. The methods as described here do not represent all possible procurement programs, nor are they as detailed as they might be in practice. However, they are adequate in synthetic analyses to suggest the direction of "best" adjustments.

Because of the economies of scale which exist in assembling and processing poultry, it was hypothesized that the relative advantages of alternative procurement, production, and sales policies might differ for firms of various capacities. Hence, the analyses include model plants ranging in capacity from 1,800 to 10,000 broilers per hour. Plants in this range of sizes process most of the poultry in the United States.

Broilers purchased.--All of the broilers processed are acquired by purchases on the open market. Prices are determined by using the 1957-59 average monthly prices in cents per pound paid at the farm for broilers and fryers in the Boston area (New England), as reported by the USDA Market News Service. These prices averaged about 18 cents per pound for the 3-year period.

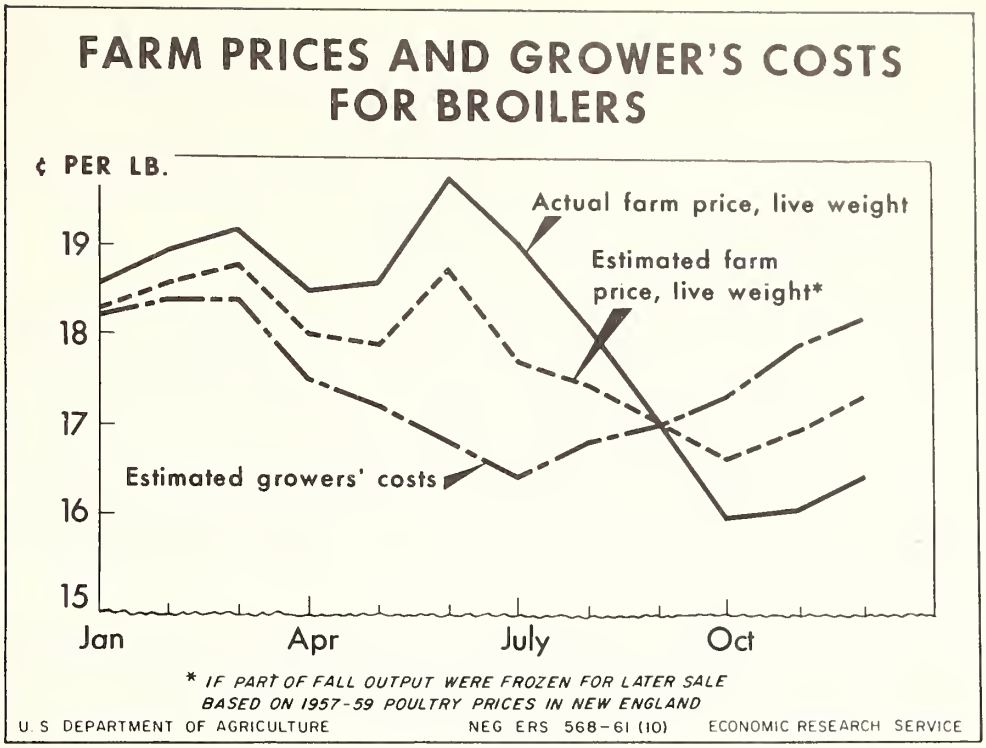

Figure 2

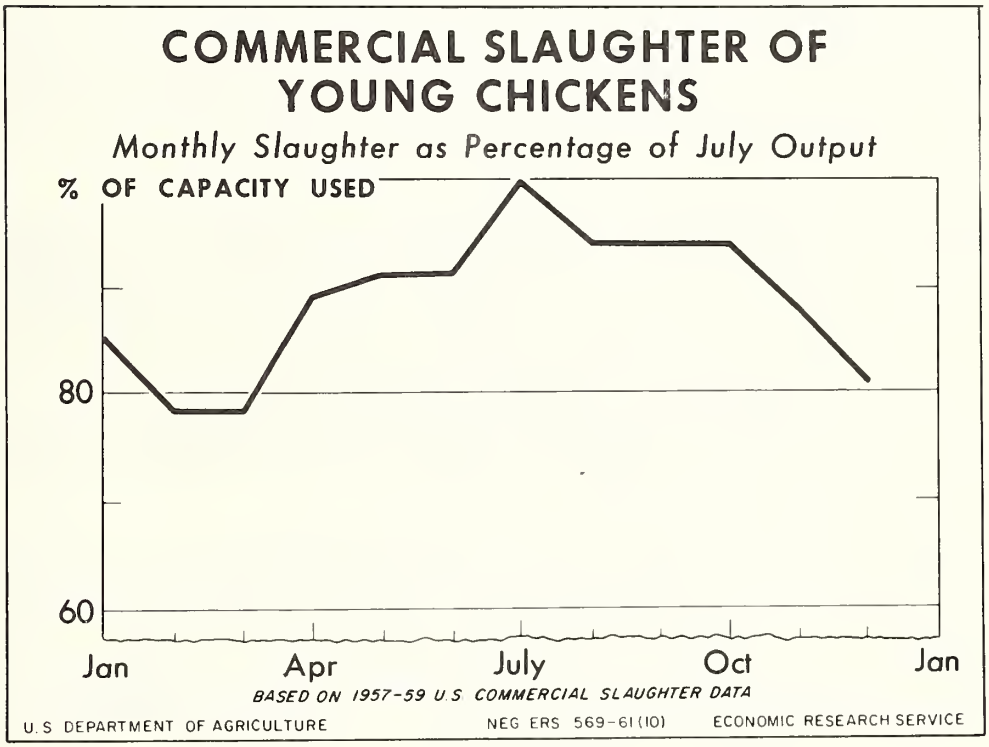

Figure 3

Direct contracting.--All broilers processed are grown for the plant under contract. An average annual cost of 17.5 cents per pound was assumed. Monthly costs were computed by using seasonal indices based on the ratio-to-trend of observed seasonal variations in feed conversion during the period 1956-58. 5/ The difference of 0.5 cent per pound between the average annual growing cost and the average live market price was assumed, on the basis of practices during 1957-58, to be a reasonable allowance to contract participants other than the grower for risk and for carrying charges on feed, chicks, and supplies.

Three-way contracts.--All of the broilers processed are grown under contract, with profits or losses shared equally by the processor, feed dealer, and hatchery. Cost was assumed the same as under direct-contract growing with processors only and settlement price the same as if broilers has been purchased. No loss was charged against the grower if the price was below cost. If price exceeded cost, the grower received 50 percent of this sum and the other participants were given equal shares of the remaining 50 percent. Under this procurement system, the net cost to the processor averaged about 17.9 cents per pound on an annual basis, but was intermediate between growing cost and market price in each month due to the sharing of profits and losses.

Purchase-contract combination.--Fifty percent of the broilers processed are purchased on the open market and 50 percent are grown for the plant under contract. Cost to the processor under this program on an annual basis, and for each month, was halfway between growing cost and market price.

The first three procurement programs represent pure types. In practice, some New England firms used a combination of two or more alternative procurement programs in 1957. Frequently this approach was due to a passive attitude toward procurement of live poultry. Contracts were used by some processors to supplement the volume available on the open market. In contrast, other processors have used contracting as the major means to build volume. Some other processors have elected to restrict their basic volume from contracting because of the marked discrepancies which exist in some months between growing costs and prices of live broilers on the open market.

Comparative net returns.--For each type of production or selling program direct contracting was the most profitable procurement program and buying broilers live on the open market was the least profitable. Three-way contracting was more profitable than buying on the open market. A combination of buying on the open market and contract growing ranked second to 100-percent contract growing. The returns to scale for any one type of procurement program result from the economies available from assembling and processing as plant size increases. Under the price assumptions in this study, the absolute differences in cents per pound between procurement programs remain constant as plant size increases, and within any one production or sales program (fig. 4).

In the long run, participation by the processing plant, alone or in conjunction with feed dealers and hatcheries, in contract growing programs merits the allowance of differentials from open-market prices. These differentials cover the risks shifted to contract participants other than the grower, and carrying charges on feed, chicks, supplies, and services furnished. In some short-run situations, these differentials may not be maintained. Here, because of economies of scale in assembling

5/ As reported by Clark R. Burbee, Capital Accumulation Potential of Contract Broiler Growers, M.S. thesis, University of New Hampshire, May 1960.

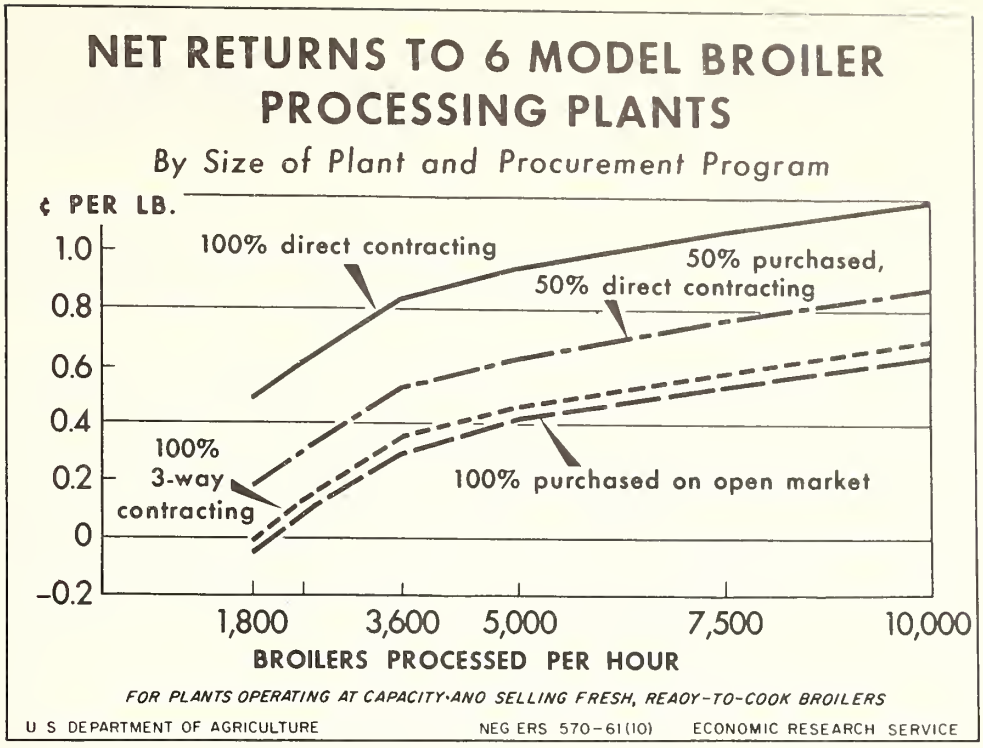

Figure 4

and processing, large integrated firms may frequently be able to withstand higher costs on growing without incurring a loss on overall operations.

Tables 5 and 6 contain the computed net returns, in dollars and in cents per pound. 6/ Net returns were positive for all procurement, production, and sales programs for plant sizes of 3,600 broilers per hour and above. In contrast, negative values were obtained for certain situations where plants of 1,800 and 2,400 broilers per hour were buying all their birds on the open market or obtaining them under three-way contracting.

Output Programs

Broiler processors can choose between operating at capacity or varying the level of operation from season to season. They can process broilers only or use other market classes to supplement broilers. Capacity operation obviously results in lower costs than operation at less than capacity. It is less obvious whether capacity operation is more profitable when differences in market prices throughout the year are considered.

Capacity operations.--Since minimum costs per unit of product result from capacity operation in assembling and processing broilers, the various procurement programs were tested for each model plant size with operation at 100 percent of

6/ Tables 5 to 10 are in Appendix I.

capacity. This production level, as defined herein, assumed 247 8-hour operating days per year. These were distributed by months as follows: January, 20; February, 19; March, 21; April, 21; May, 21; June, 21; July, 21; August, 22; September, 21; October, 22; November, 18; December, 20. Capacity was calculated in terms of the number of 3.5-pound live broilers which could be assembled and processed in the given number of operating days.

In the computations on broilers, it was assumed that the yield of eviscerated weight from live weight for broilers was 73 percent. The rate of condemnation from ante- and post-mortem inspection was assumed to be 3.5 percent of the eviscerated weight.

Selling prices, when broilers were sold in fresh-killed ice-packed form, with 80 percent ready-to-cook whole and 20 percent cut-up, were derived from USDA Market News series. The category used as a base was 2- to 3-pound ready-to-cook ice-packed broilers and fryers, delivered to retailers at Boston. A deduction of 1.4 cents per pound was made from 1957-59 average monthly prices to reduce the delivered price to a plant equivalent value. This deduction covered transportation costs from plant to market on the total ready-to-cook weight and a wholesaling margin on a share of the volume. Undergrades were priced at 75 percent of the plant equivalent price for grade A broilers. It was assumed that 90 percent of the output would bring the grade A price.

Variable operations.--Many plants adjust slaughter seasonally because of seasonal shifts in demand and prices. A second production level involving seasonal variation of operations was tested against the operation at capacity. The variable level of operations was calculated by using ratios-to-trend of the monthly slaughter of young chickens in the United States, during 1957-59, as reported in the Commercial Poultry Slaughter Report. Monthly outputs and per pound costs were adjusted for average daily rates of operation at these percentages of capacity: January, 85; February, 78; March, 78; April, 89; May, 91; June, 91; July, 100; August, 94; September, 94; October, 94; November, 88; December, 81.

Figure 3 showed seasonality of plant output if the production program followed a pattern similar to the total commercial slaughter of young chickens by plants in the United States. It can be assumed that many individual plants had production programs which were more variable than the slaughter pattern since the total is composed of many offsetting deviations. The pattern shown in figure 3 would be more favorable than many firms achieved.

Supplementing broilers with fowl.--A third production program involved the same seasonal output of broilers as in the second program. In addition, it was assumed the plant could obtain and process enough other poultry to operate at capacity. In these calculations, cost data for fowl were used for the additional quantities. It was assumed that the live-to-eviscerated margin for fowl would cover total costs plus shrinkage and condemnation. While the resulting seasonal pattern of slaughter of fowl is atypical, it serves to measure the effect on total net returns of lowering assembling and processing costs on broilers by full use of resources, even if no profit accrued on the supplementary market classes. If suitable cost data were available for market classes other than fowl, these could be substituted under similar assumptions without changing the net results.

In practice, the possibilities for using fowl or other market classes to supplement supplies of broilers vary by areas. Many plants can successfully work out such a program provided their outlets are sufficiently flexible to handle other classes

without prejudice to the processor's long- or short-run goals for broilers. Figure 5 suggests that the seasonal peaks for slaughter of broilers, fowl, and turkeys are different enough to admit such a possibility. Some plants may also be able to acquire, or to process on contract, such specialty items as rock-cornish game hens, guineas, game birds, ducks, and geese.

Comparative net returns.--None of the various live prices or cost-and-selling-price relationships used in this study resulted in any gain from operating at less than capacity. It was more profitable to operate at capacity than to vary volume with existing seasonality of demand and prices (table 7).

Net returns were improved by capacity operations, either where broilers were the only market class or where other market classes were used to supplement a variable output of broilers. Because of the assumption that operating margin was equal to costs on supplementary items, the gains were not as large as with capacity operations on broilers alone. Nevertheless, gains did occur because the supplementary items carried a share of both the fixed and variable costs. This would be true despite some diseconomies accruing to a firm handling more than one market class. Diseconomies arise from the loss of operating time during changeover from one class to another and the additional managerial and service activity.

In the present market environment, a plant can seldom increase its share of the market for fresh broilers when demand declines seasonally. This makes the use of supplementary items a more feasible alternative if the plant confines itself to doing its own selling and sells only the fresh form. Most plants can realistically confine their programs to capacity operations on broilers alone by selling at least a portion of their output in frozen or further-processed form, provided they can fully recover the additional costs which would be incurred.

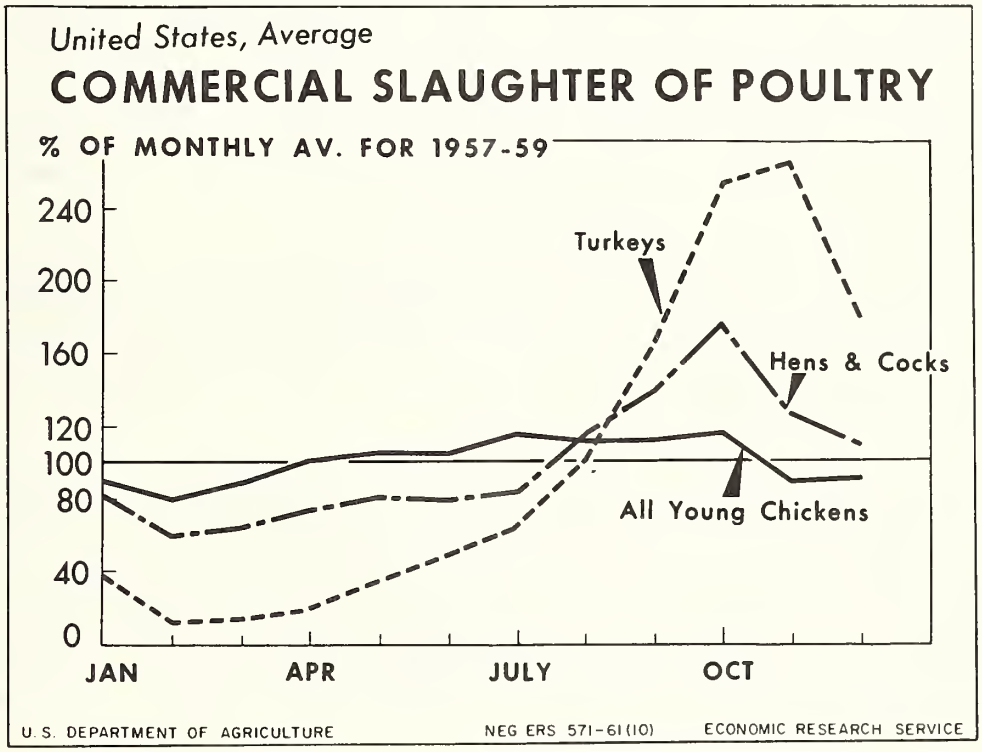

Figure 5

If the seasonal pattern of commercial slaughter of young chickens in the United States during 1957-59 (ratios-to-trend of monthly quantities) is assumed as representative of a typical plant, net returns resulting can be used as a base with which to compare other production programs (table 7).

Selling Programs

In the foregoing analyses net returns were best with capacity operations on broilers. However, even if only a few firms operate at capacity on broilers and sell in fresh form, the resulting competition might reduce the number of processing plants. If any substantial number of firms followed this pattern, total supplies would be increased and prices depressed in almost every month of the year. This would aggravate present problems.

On the other hand, the potential cost saving is a compelling reason to seek ways to operate at capacity. This might be accomplished by selling in other forms than fresh-killed broilers. The principal alternatives would be frozen broilers and further-processed products in which chicken may be only one of the ingredients. New product lines can best be used to build additional consumption rather than to largely displace fresh-killed broilers (see appendix II for a theoretical explanation of this position).

To enable total output to be increased without price-depressing effects, consumers would have to eat more broiler meat. If consumption of fresh-killed broilers remained at about present rates, the net increase would be in other product forms.

Subsequent analyses are based upon the assumption that some net increase in total consumption of broiler meat is a distinct possibility. It is also assumed that competition will result in further reductions in numbers of processors.

Frozen broilers.--Some firms in the industry are already producing and selling frozen whole or cut-up broilers. This has the obvious advantage of decreasing the seller's vulnerability to current market prices. It can be regarded as a possibility for offsetting seasonally depressed fresh-market prices.

However, frozen and fresh whole or cut-up broilers are likely to be directly competitive if frozen volume is increased substantially. Moreover, additional costs would be incurred for freezing, storing, packaging, handling, advertising, merchandising, and short-term credit. Prices for the frozen form would need to be higher than fresh-market equivalent prices to reflect an equally profitable net value at the processing level.

Freezing costs can be estimated at 0.50 cent per pound, eviscerated weight (3, p. 7), the first month's storage at 0.75 cent per pound, and storage in later months at 0.25 cent per pound, eviscerated weight (13, p. 8). For 8 months, costs would total about 3 cents per pound of eviscerated weight. Including a net increase in labor and packaging costs, allowance for advertising, merchandising, and short-term credit, plus any adjustment in shrinkage, would add another 3 cents or more per pound when selling in frozen versus fresh form. Recovery of all these additional costs is problematical, but necessary if a modified sales program is to be as profitable as alternative programs.

Two modified sales programs were analyzed to test the results of storing part of the output in frozen form for later sale. The assumed storage program involved only 5 percent of annual output. Because October, November, and December were the months when the largest and most consistent net losses appeared when selling in fresh form, a portion of the output in these months was assumed to be frozen and stored, and sold from May to August when demand and prices are better. Under the first program it was assumed that the plant was an innovator and that its action would not materially affect the general level of fresh-market prices.

Under the second sales program, it was assumed that the seasonal modification in sales became a general industry practice, modifying the seasonal pattern of prices. Two recent articles suggested that a change of ∓ 25 to 35 percent in volume would result in a ± 10 percent change in retail broiler prices. 7/ In calculations under the second sales program, the assumed ratio was ∓ 25 percent change in volume with a ± 10 percent change in price.

Figure 6 shows the per pound sales values at the processing plant under 1957-59 average conditions, and the resulting modifications of these values if most firms in the industry adjusted sales seasonally under the assumptions of this analysis. Figure 7 illustrates the volume changes such a program of seasonally adjusted sales would involve.

If most plants in the industry produced entirely for the fresh market, a single firm might store a portion of its output in low-price months for sale in frozen form when prices are higher. It could do this without affecting fresh-market values, assuming that consumers accepted frozen and fresh broilers equally and that all additional costs for frozen broilers could be recovered. So long as this practice remained innovative, the processing plant could increase its net returns above those received if total output was sold in the fresh form. Such a situation would at best be short-lived. If other firms followed this lead, the existing price pattern could be substantially modified. If a portion of the October-December output of most firms was withheld from the fresh market, fresh-equivalent prices would be raised during these months, but lowered during the May-August period when the frozen forms would be sold. This program would lower net returns greatly from the innovative stage (see table 8).

New products.--Total output would increase if broiler-processing plants operated at capacity, rather than at reduced levels in certain seasons. If this increase could be diverted into products not directly competitive with fresh or frozen whole or cut-up broilers, prices at the plant level would not be materially affected.

Even though the fresh-market-equivalent price was not affected, prices of other forms would need to be higher to cover additional costs. Whether the further processing was performed by the broiler-processing plant or elsewhere in marketing channels, additional costs would be involved for freezing, storage, packaging, handling, research and development, advertising, merchandising, short-term credit, and shrinkage. If these costs were recovered, the present level of fresh-market-equivalent prices maintained, and sales continued at the present seasonal pattern, net

7/ For each ∓ 10% change in price, sales at retail changed ∓ 25-35% (10, p. 28). "On the basis of preliminary studies of the postwar period, it appears that when the price would drop by, say 10%, housewives would buy not merely 10% more broilers, but actually about 30% more" (12). These examples involve short-run elasticity of demand for broilers, or changes within a year. On an annual basis, however, demand is relatively inelastic.

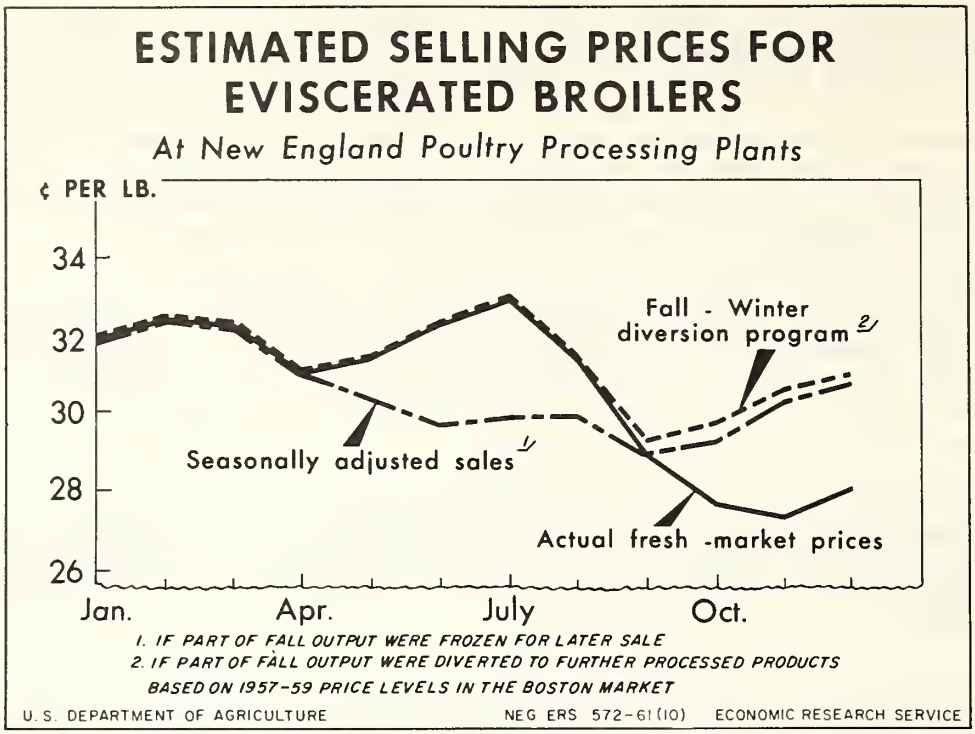

Figure 6

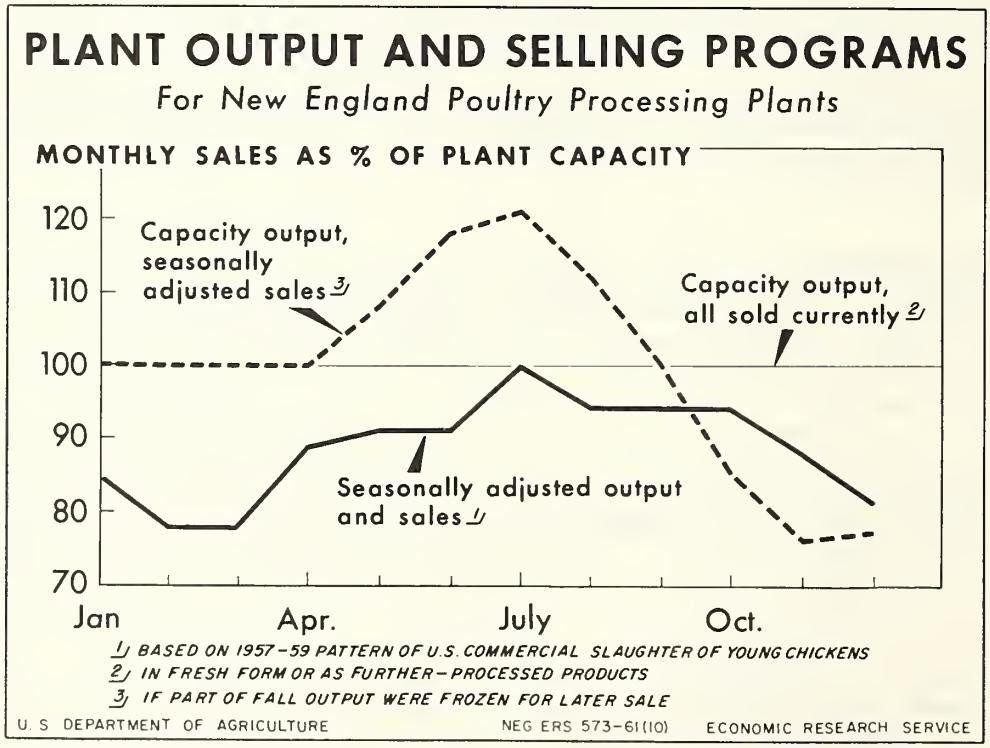

Figure 7

returns to plants would be favorable (table 8). While somewhat less than those obtainable for a few plants by partial use of frozen broilers, they would be considerably above those obtainable if most firms used frozen broilers to seasonally modify sales.

The most persistent problem of the industry is declining demand and depressed prices in the fall and winter. Figure 8 shows the monthly and annual profit-and-loss positions for several production and sales programs for a firm which can process 3,600 broilers per hour and which obtains its birds entirely through contract growing. Other plant sizes and procurement programs yield similar results. In a market price framework, all plants lost money in October, November, and December, and made money in the spring and summer. Any attempt to cut output in the last quarter resulted in higher costs per pound during the balance of the year. In this example, losses in the last quarter were not materially reduced by the cutback in output.

In the two situations where sales were adjusted seasonally by freezing and storing for later sale, monthly profits and losses were based on actual sales less current costs. If product in storage were credited at inventory value, the monthly pattern of profits and losses would more nearly resemble those where sales were entirely from current output.

If imaginative new products, attractively packaged and presented, are well-accepted by consumers, an additional way to attack the fall and winter price problem will be opened. Sales of fresh broilers could be continued at present rates during January-August and the prevailing basic price level maintained. Some diversion to further-processed products could be carried out in most months. Additional diversion from fresh-market outlets to further-processed products could be attempted during September-December. If carried to its logical extent, this diversion could raise fresh-market-equivalent values to the point where operating losses in these months would be eliminated. Such a program would provide higher net returns at the processing level than any other selling programs considered (see table 8).

Changes in structure and practices.--Intensified competition in the broiler industry has focused the attention of management on finding small cost savings per unit of output. Conversely, management should also be concerned with realizing additional returns per unit of output, even if small. In volume operations, such small amounts per unit of output aggregate to large dollar gains to the firm.

Net returns summarized in table 6 for various procurement, production, and selling programs fall within a range of -0.21 to + .98 cent per pound for a broiler plant with a capacity of 1,800 head per hour. For a plant with a capacity of 10,000 broilers per hour, the range was + 0.56 to + 1.66 cents per pound.

The total dollar net returns reported in table 5 are expressed in table 9 as a percentage of total dollar sales. These ranged from -0.97 percent to + 4.41 percent for a plant with a capacity of 1,800 broilers per hour. For the 10,000 size, the range was + 2.58 percent to + 7.53.

While the differences reported are smaller than those from many earlier cost and efficiency studies, they are nevertheless significant and crucial. Moreover, they can be achieved mainly by changing factors external to plant operations. These factors fall within the area now commonly labeled market structure and practices. In general, the changes necessary are in the direction of closer coordination or integration of various production and marketing functions.

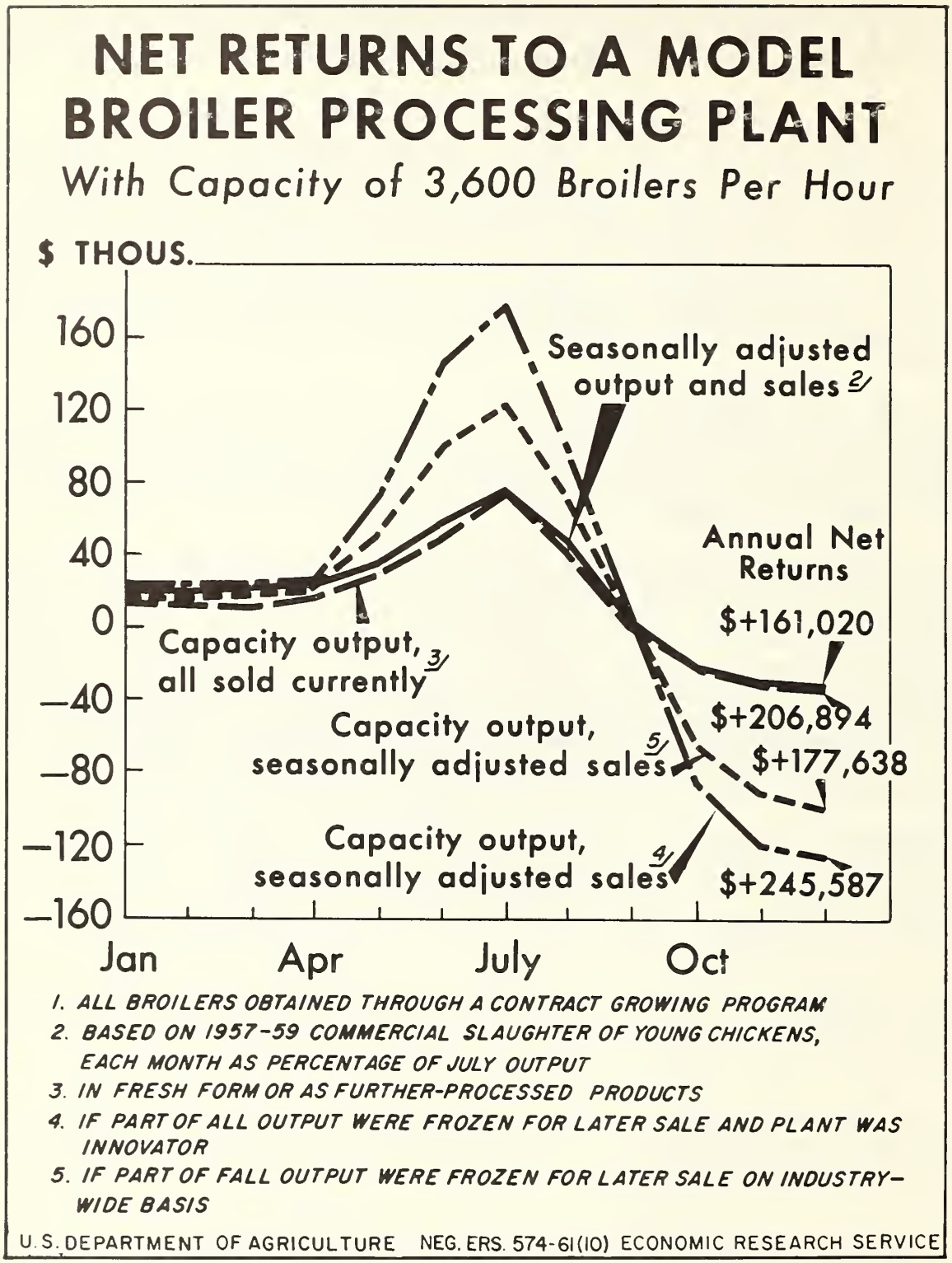
NET RETURNS TO A MODEL BROILER PROCESSING PLANT
With Capacity of 3,600 Broilers Per Hour
$ THOUS.
160
120
80
40
0
—40
—80
—120
—160
Jan
Apr
July
Oct
Seasonally adjusted output and sales 2/
Annual Net Returns
$+161,020
Capacity output, all sold currently 3/
$+206,894
Capacity output, seasonally adjusted sales 5/
$+177,638
Capacity output, seasonally adjusted sales 4/
$+245,587
1. ALL BROILERS OBTAINED THROUGH A CONTRACT GROWING PROGRAM
2. BASED ON 1957-59 COMMERCIAL SLAUGHTER OF YOUNG CHICKENS, EACH MONTH AS PERCENTAGE OF JULY OUTPUT
3. IN FRESH FORM OR AS FURTHER-PROCESSED PRODUCTS
4. IF PART OF ALL OUTPUT WERE FROZEN FOR LATER SALE AND PLANT WAS INNOVATOR
5. IF PART OF FALL OUTPUT WERE FROZEN FOR LATER SALE ON INDUSTRY-WIDE BASIS
U.S. DEPARTMENT OF AGRICULTURE NEG. ERS. 574-61(10) ECONOMIC RESEARCH SERVICE

Figure 8

Increasing total sales of fresh-killed poultry, or the share of the market, for many individual plants is unlikely during periods when demand declines. Hence, use or sale for storage or further processing offers the best opportunity to expand volume. This might involve some difficulties unless the processing plant was part of a vertically integrated organization.

There is certainly greater impetus for more rapid development of processor-distributor integration where frozen and especially further-processed forms are involved. The individual processor generally would be faced with a high cost of introducing his own branded products. He might more easily obtain store display space by packing for chains or for established-brand distributors.

If the industry moves in these directions, certain structural adjustments could occur: (1) increased coordination between processing plants; (2) specialization by some plants in serving the fresh market and by others in serving the frozen and further-processed product markets; (3) more formalized business relationships with distributors or chainstore organizations; or (4) vertical integration of processors with brand distributors. Such an integration of processors with distributors could be local or national in scope.

The achievement of capacity operations, minimum costs, and maximum net returns at the processing level may depend on (1) further limiting fresh-market sales during what are now low-price months in an effort to raise fresh-market prices; and (2) cost-plus pricing of other product forms at the plant level and pricing by using other techniques at other levels in marketing channels.

SELECTION OF ALTERNATIVE PROGRAMS WHEN CAPITAL IS LIMITED

If a firm has limited capital with which to change its operations to increase net returns, it may wish to order successive changes in logical fashion. The mere ranking of alternative programs according to the potential net returns which may be expected does not provide an automatic solution. Factors which must be considered are (1) the amount and type of capital available; (2) the present characteristics of the firm and its long-range goals; (3) the time needed to put each change into effect; and (4) the present and future structure of the industry.

Table 10 ranks the potential net returns from various procurement, plant output, and selling programs, for model plants of six sizes. Size of plant appears to make no significant differences in these rankings. However, within each production and selling program, the procurement program chosen has an important effect on potential net returns.

If a plant wishes to compete effectively in the mass market for broilers, it should first obtain a high degree of control over its supply. Historically, the principal way chosen by processing plants to do this has been the development of closer integration or coordination of production and processing, including heavy reliance upon contract-growing programs. Under the conditions of this analysis, direct contracting between the plant and the grower resulted in the largest potential net returns. Moreover, under direct contracting the plant obtains the maximum control over quality and the scheduling of output. Both are important to successful operations. A program to control supply requires short-term (or operating) capital. This may be easier to obtain than long-term (or investment) capital.

If short-term capital was obtained and contract growing begun, capacity operation would become the second goal. If short-term capital was not obtained, capacity operation could be the first goal. Initially, the volume of broilers could be supplemented with other market classes. Eventually, the plant may gain from concentrating on broilers.

Assuming that increased costs are fully recoverable, operating the plant at capacity and selling some of the fall and winter output in frozen form during the spring and summer would benefit a few innovating firms. The advantage may not last long if other firms follow this practice. Hence, if a firm shifts to selling frozen whole or cut-up birds, it should prepare to make further changes at an early date.

Some basic changes in industry structure and practices are necessary if potential benefits are to be fully realized even by individual firms. Diversion of fall-winter output would need to be widespread to raise fresh-market prices in the entire industry. If this practice proceeded far enough, it might enable some firms to specialize in serving the fresh market at improved rates of return. For a theoretical rationale of the effects of increased emphasis on output of further-processed products by the broiler industry, see appendix II. Increased emphasis on these products would require substantial capital investment. Moreover, the development and introduction of acceptable new products may involve a substantial amount of both risk and time.

In summary, the usual order of changes to increase net returns at the processing level should be: (1) Direct-contract growing; (2) capacity operations; and (3) increased emphasis on output of further-processed products. None of these changes can be accomplished quickly or painlessly.

The practice of contract growing is already well-established in the industry, but often the processor is not the primary contractor. If someone else is the primary contractor, the supply of broilers furnished may not enable the processor to operate most efficiently. With economies of scale existing in poultry processing, there has been a movement toward fewer and larger plants. As competition has intensified, firms have attempted to operate at a high percentage of capacity, but the structure of the industry and seasonality of demand and prices often prevent them from reaching this goal. The industry has become very product-conscious in recent years. But before further-processed products can play their most constructive role in enhancing net returns at the processing level, fundamental changes in industry structure and practices must occur.

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Table 5.--Net annual returns to 6 model broiler-processing plants, by type of procurement, output and selling program and by size of plant

Output and selling program and size of plant	Procurement program for live broilers			
	Purchase on open market	3-way contracting	Direct contracting	Combination 1/
	1,000 dol.	1,000 dol.	1,000 dol.	1,000 dol.
Capacity operations:				
Broilers only:				
Current price pattern:				
1,800 broilers per hour	-5.8	+1.1	+61.2	+22.2
2,400 broilers per hour	+12.7	+21.8	+102.1	+50.0
3,600 broilers per hour	+72.9	+86.5	+206.9	+128.8
5,000 broilers per hour	+140.3	+159.3	+326.4	+217.9
7,500 broilers per hour	+275.8	+304.2	+555.0	+392.3
10,000 broilers per hour	+444.5	+482.4	+816.8	+599.8
Current price pattern, sales modified seasonally by innovating firms:				
1,800 broilers per hour	+17.8	+29.6	+81.0	+47.6
2,400 broilers per hour	+44.1	+59.8	+129.4	+83.9
3,600 broilers per hour	+119.1	+142.7	+245.6	+178.8
5,000 broilers per hour	+205.6	+238.4	+381.3	+288.6
7,500 broilers per hour	+373.8	+423.0	+637.3	+498.2
10,000 broilers per hour	+575.2	+640.7	+926.5	+741.0
Prices modified seasonally, sales modified seasonally by most firms:				
1,800 broilers per hour	-16.6	-4.8	+46.6	+13.2
2,400 broilers per hour	-1.7	+14.0	+82.6	+38.1
3,600 broilers per hour	+51.2	+74.8	+177.6	+110.9
5,000 broilers per hour	+110.1	+142.9	+285.8	+193.1
7,500 broilers per hour	+230.6	+279.7	+494.0	+354.9
10,000 broilers per hour	+384.2	+449.7	+735.5	+550.0
September-December prices raised by diversion of output to further-processed products:				
1,800 broilers per hour	+54.4	+61.2	+121.4	+82.4
2,400 broilers per hour	+93.0	+102.1	+182.3	+130.2
3,600 broilers per hour	+193.2	+206.9	+327.2	+249.1
5,000 broilers per hour	+307.4	+326.4	+493.6	+385.1
7,500 broilers per hour	+526.5	+554.9	+805.7	+643.0
10,000 broilers per hour	+778.7	+816.7	+1,151.0	+934.1
Broilers and fowl, current price pattern:				
1,800 broilers per hour	-4.7	+2.4	+58.9	+22.1
2,400 broilers per hour	+11.9	+21.4	+96.7	+47.6
3,600 broilers per hour	+69.1	+83.3	+196.3	+122.6
5,000 broilers per hour	+133.6	+153.4	+310.3	+208.0
7,500 broilers per hour	+261.7	+291.3	+526.8	+373.3
10,000 broilers per hour	+427.1	+466.7	+780.6	+575.9
Variable operations:				
Broilers only, current price pattern:				
1,800 broilers per hour	-23.1	-16.0	+40.5	+3.7
2,400 broilers per hour	-11.7	-2.2	+73.1	+24.0
3,600 broilers per hour	+33.8	+48.0	+161.0	+87.3
5,000 broilers per hour	+85.6	+105.4	+262.3	+160.0
7,500 broilers per hour	+197.0	+226.7	+462.1	+308.6
10,000 broilers per hour	+344.6	+384.4	+698.3	+493.6

1/ 50 percent from contract growers and 50 percent purchased on open market.

Table 6.--Net returns per pound to 6 model broiler-processing plants, by type of procurement, output, and selling program and by size of plant

Output and selling program and size of plant	Procurement program for live broilers			
	Purchase on open market	3-way contracting	Direct contracting	Combination 1/
	Cents	Cents	Cents	Cents
Capacity operations:				
Broilers only:				
Current price pattern:				
1,800 broilers per hour	-.05	+.01	+.49	+.18
2,400 broilers per hour	+.08	+.13	+.61	+.30
3,600 broilers per hour	+.29	+.35	+.83	+.52
5,000 broilers per hour	+.41	+.46	+.94	+.63
7,500 broilers per hour	+.53	+.59	+1.07	+.76
10,000 broilers per hour	+.64	+.70	+1.18	+.87
Current price pattern, sales modified by innovating firms:				
1,800 broilers per hour	+.14	+.24	+.65	+.38
2,400 broilers per hour	+.27	+.36	+.78	+.51
3,600 broilers per hour	+.49	+.56	+.99	+.72
5,000 broilers per hour	+.59	+.69	+1.10	+.83
7,500 broilers per hour	+.72	+.82	+1.23	+.96
10,000 broilers per hour	+.83	+.93	+1.34	+1.07
Prices modified seasonally, sales modified seasonally by most firms:				
1,800 broilers per hour	-.13	-.04	+.37	+.11
2,400 broilers per hour	-.01	+.08	+.50	+.23
3,600 broilers per hour	+.21	+.30	+.71	+.45
5,000 broilers per hour	+.32	+.41	+.83	+.56
7,500 broilers per hour	+.44	+.54	+.75	+.68
10,000 broilers per hour	+.55	+.65	+1.06	+.80
September-December prices raised by diversion of output to further-processed products:				
1,800 broilers per hour	+.44	+.49	+.98	+.66
2,400 broilers per hour	+.56	+.61	+1.10	+.78
3,600 broilers per hour	+.78	+.83	+1.31	+1.00
5,000 broilers per hour	+.89	+.94	+1.43	+1.11
7,500 broilers per hour	+1.01	+1.07	+1.55	+1.24
10,000 broilers per hour	+1.13	+1.18	+1.66	+1.35
Broilers and fowl, current price pattern:				
1,800 broilers per hour	-.04	+.02	+.46	+.17
2,400 broilers per hour	+.07	+.13	+.57	+.28
3,600 broilers per hour	+.27	+.33	+.77	+.48
5,000 broilers per hour	+.38	+.44	+.89	+.59
7,500 broilers per hour	+.50	+.55	+1.00	+.71
10,000 broilers per hour	+.61	+.67	+1.12	+.82
Variable operations:				
Broilers only, current price pattern:				
1,800 broilers per hour	-.21	-.14	+.36	+.03
2,400 broilers per hour	-.08	-.02	+.50	+.16
3,600 broilers per hour	+.15	+.22	+.73	+.40
5,000 broilers per hour	+.28	+.34	+.86	+.52
7,500 broilers per hour	+.43	+.49	+1.00	+.67
10,000 broilers per hour	+.56	+.63	+1.14	+.80

1/ 50 percent from contract growers and 50 percent purchased on open market.

Table 7.--Net annual returns to model broiler-processing plants operating seasonally, and net change in returns under capacity operations by plant size and procurement program.

Plant capacity and procurement program	Returns under seasonal operation, broilers only	Change in returns with operations at full capacity	
		Broilers only	Broilers and fowl
	1,000 dol.	1,000 dol.	1,000 dol.
1,800 broilers per hour:			
Purchased	-23.1	+ 17.3	+ 18.4
3-way contracting	-16.0	+ 17.0	+ 18.4
Combination	+ 3.7	+ 18.5	+ 18.4
Direct contracting	+40.5	+ 20.7	+ 18.4
2,400 broilers per hour:			
Purchased	-11.7	+ 24.5	+ 23.6
3-way contracting	-2.2	+ 24.1	+ 23.6
Combination	+24.0	+ 26.0	+ 23.6
Direct contracting	+73.1	+ 29.0	+ 23.6
3,600 broilers per hour:			
Purchased	+33.8	+ 39.1	+ 35.3
3-way contracting	+48.0	+ 38.5	+ 35.3
Combination	+87.3	+ 41.5	+ 35.3
Direct contracting	+161.0	+ 45.9	+ 35.3
5,000 broilers per hour:			
Purchased	+ 85.6	+ 54.7	+ 48.0
3-way contracting	+105.4	+ 53.9	+ 48.0
Combination	+160.0	+ 58.0	+ 48.0
Direct contracting	+262.3	+ 64.1	+ 48.0
7,500 broilers per hour:			
Purchased	+197.0	+ 78.7	+ 64.6
3-way contracting	+226.7	+ 77.5	+ 64.6
Combination	+308.6	+ 83.6	+ 64.6
Direct contracting	+462.1	+ 92.9	+ 64.6
10,000 broilers per hour:			
Purchased	+344.6	+ 99.9	+ 82.5
3-way contracting	+384.4	+ 93.0	+ 82.2
Combination	+493.6	+106.1	+ 82.2
Direct contracting	+698.3	+118.4	+ 82.2

Table 8.--Net annual returns to 6 model broiler-processing plants selling entire output fresh-killed, and change in returns when part of output is sold in other forms

Plant capacity and broiler procurement program	Returns when entire output of all plants is sold fresh-killed	Net change in returns when part of output is sold in other forms		
		Part of output frozen for later sale		Part of fall-winter output diverted to further-processed products, all plants
		By a few plants only	By all plants	
	1,000 dol.	1,000 dol.	1,000 dol.	1,000 dol.
1,800 broilers per hour:				
Purchased	-5.8	+ 23.5	-10.8	+ 60.2
3-way contracting	+1.1	+ 28.5	- 5.9	+ 60.2
Combination 1/	+22.2	+ 25.4	- 9.0	+ 60.2
Direct contracting	+61.2	+ 19.8	-14.6	+ 60.2
2,400 broilers per hour:				
Purchased	+12.7	+ 31.4	-14.5	+ 80.2
3-way contracting	+21.8	+ 38.0	- 7.9	+ 80.2
Combination 1/	+50.0	+ 33.9	-11.9	+ 80.2
Direct contracting	+102.1	+ 27.3	-19.5	+ 80.2
3,600 broilers per hour:				
Purchased	+ 72.9	+ 46.2	-21.7	+120.3
3-way contracting	+ 86.5	+ 56.2	-11.8	+120.3
Combination 1/	+128.8	+ 50.0	-17.9	+120.3
Direct contracting	+206.9	+ 38.7	-29.3	+120.3
5,000 broilers per hour:				
Purchased	+140.3	+ 65.4	-30.1	+167.1
3-way contracting	+159.3	+ 79.2	-16.4	+167.1
Combination 1/	+217.9	+ 70.6	-24.9	+167.1
Direct contracting	+326.4	+ 54.9	-40.6	+167.1
7,500 broilers per hour:				
Purchased	+275.8	+ 98.0	-45.2	+250.7
3-way contracting	+304.2	+118.7	-24.5	+250.7
Combination 1/	+392.2	+105.9	-37.3	+250.7
Direct contracting	+555.0	+ 82.3	-60.9	+250.7
10,000 broilers per hour:				
Purchased	+444.5	+130.7	-60.3	+334.3
3-way contracting	+482.4	+158.3	-32.7	+334.3
Combination 1/	+599.8	+141.3	-49.8	+334.3
Direct contracting	+816.8	+109.8	-81.3	+334.3

1/ Fifty percent from direct contracting and 50 percent purchased on open market.

Table 9.--Net returns as percentage of total dollar sales of 6 model broiler-processing plants, by type of procurement, output, and selling program, and by size of plant

Output and selling program and size of plant	Procurement program for live broilers			
	Purchase on open market	3-way contracting	Direct contracting	Combination 1/
	Percent	Percent	Percent	Percent
Capacity operations:				
Broilers only:				
Current price pattern:				
1,800 broilers per hour	-0.21	+0.04	+2.28	+0.82
2,400 broilers per hour	+ .35	+ .61	+2.85	+1.39
3,600 broilers per hour	+1.35	+1.61	+3.85	+2.39
5,000 broilers per hour	+1.88	+2.13	+4.37	+2.92
7,500 broilers per hour	+2.46	+2.71	+4.95	+3.50
10,000 broilers per hour	+2.97	+3.23	+5.46	+4.01
Current price pattern, sales modified by innovating firms:				
1,800 broilers per hour	+ .66	+1.09	+2.99	+1.76
2,400 broilers per hour	+1.22	+1.66	+3.55	+2.32
3,600 broilers per hour	+2.20	+2.63	+4.53	+3.30
5,000 broilers per hour	+2.73	+3.17	+5.07	+3.83
7,500 broilers per hour	+3.31	+3.75	+5.64	+4.41
10,000 broilers per hour	+3.82	+4.26	+6.15	+4.92
Prices modified seasonally, sales modified seasonally by most firms:				
1,800 broilers per hour	- .62	- .18	+1.74	+ .49
2,400 broilers per hour	- .05	+ .39	+2.31	+1.07
3,600 broilers per hour	+ .96	+1.40	+3.32	+2.07
5,000 broilers per hour	+1.48	+1.92	+3.85	+2.60
7,500 broilers per hour	+2.07	+2.51	+4.43	+3.18
10,000 broilers per hour	+2.58	+3.03	+4.95	+3.70
September-December prices raised by diversion of output to further-processed products:				
1,800 broilers per hour	+1.98	+2.23	+4.41	+2.99
2,400 broilers per hour	+2.53	+2.78	+4.97	+3.55
3,600 broilers per hour	+3.51	+3.76	+5.95	+4.53
5,000 broilers per hour	+4.02	+4.27	+6.46	+5.04
7,500 broilers per hour	+4.59	+4.84	+7.03	+5.61
10,000 broilers per hour	+5.10	+5.34	+7.53	+6.11
Broilers and fowl, current price pattern:				
1,800 broilers per hour	- .17	+ .09	+2.16	+ .81
2,400 broilers per hour	+ .33	+ .59	+2.67	+1.32
3,600 broilers per hour	+1.28	+1.54	+3.64	+2.27
5,000 broilers per hour	+1.79	+2.06	+4.17	+2.79
7,500 broilers per hour	+2.34	+2.61	+4.72	+3.34
10,000 broilers per hour	+2.87	+3.13	+5.24	+3.87
Variable operations:				
Broilers only, current price pattern:				
1,800 broilers per hour	- .97	- .67	+1.70	+ .15
2,400 broilers per hour	- .37	- .07	+2.30	+ .75
3,600 broilers per hour	+ .71	+1.01	+3.37	+1.83
5,000 broilers per hour	+1.29	+1.59	+3.96	+2.41
7,500 broilers per hour	+1.98	+2.28	+4.65	+3.10
10,000 broilers per hour	+2.60	+2.90	+5.27	+3.72

1/ Fifty percent from contract growers and 50 percent purchased on open market.

Table 10.--Ranking of potential net dollar returns to broiler-processing plants under specified procurement, output and selling programs 1/

Output and selling program	Procurement program for live broilers			
	Purchase on open market	3-way contracting	Direct contracting	Combination 2/
Capacity operations:				
Broilers only:				
Current price pattern	20	17	4	12
Current price pattern, sales modified seasonally by innovating firms	14	11	3	8
Prices modified seasonally, sales modified seasonally by most firms	22	19	9	15
September-December prices raised by diversion of output to further-processed products	7	5	1	2
Broilers and fowl, current price pattern	21	18	6	13
Variable operations:				
Broilers only, current price pattern	24	23	10	16

1/ Programs are ranked from 1 to 24, or from largest to smallest potential net returns. Ranking is not affected by size of plant.

2/ Fifty percent from contract growers and 50 percent purchased on open market.

APPENDIX II

Theoretical Rationale for Increasing Output of Further-Processed Products

Prices paid by consumers for broilers declined over the last decade and per capita consumption increased. During these years, the industry greatly expanded output and, because of lower costs, maintained its profit position despite declining prices. Lower costs were made possible by the development and adoption of new technology in production, marketing, and industry structure.

The recent decline in broiler prices may result largely from (1) a slower rate of technological progress and (2) a more inelastic demand for fresh (or frozen) whole or cut-up broilers in ready-to-cook form. More appropriately, the segment of the demand curve on which the industry now operates may be more inelastic. It could become more so if output is expanded further and if this additional volume is sold in whole or cut-up form (fig. 9).

Foote and Fox calculated the elasticity of demand for chickens at the retail price level by several methods. A typical value for the period 1922-41 was -1.15 (5, p. 40). Examination of U.S. retail prices and per capita consumption data for the period 1949-60 suggests that while elasticity for the entire period approximates -1.0 for a linear relationship, demand is becoming relatively inelastic. Moreover, a flat S-curve seems to fit reasonably well, indicating a more inelastic trend in recent years and suggesting a value closer to -0.5.

Chicken is more widely used by various income groups than most quality meat items, mainly because of favorable prices. Nevertheless, whole or cut-up chicken has relatively low income elasticity and little "status" appeal. Hence, any increase in consumption resulting from rising incomes or from food subsidies to low-income groups would be small.

A small proportion of the total supply of broilers and a substantial proportion of the total supply of fowl is now consumed in the form of further-processed products. Some evidence suggests that the demand for further-processed products is relatively elastic. New, attractive, and convenient products seem to have higher income elasticity and greater status appeal. If this is true, diversion of a larger share of present and future broiler production from the whole or cut-up form to other products should improve industry returns. Some earlier studies offer support for this assumption.

Data collected in June and July 1956 from more than 3,100 homemakers indicated that broiler-fryer chickens (or parts) were served in more than 9 out of 10 households during the previous 12 months. Use had increased during the preceding 4 or 5 years; lower prices were an important reason for the increase. A majority of the respondents felt broilers and fryers were cheaper per serving than most fresh meats. More than one-third of them bought heavier birds or packages if broilers and fryers were selling a little cheaper than usual. However, almost half of the respondents bought largely on impulse and for reasons other than price. This group said that the major deterrent to greater use was the feeling that it would detract from the variety of their meals and cause families to tire of chicken (21, pp. 1-6, 59-61).

Differences in income seemed to have more effect on the consumption of total meat than on the consumption of chicken (18, p. 34). For the greater part of the range of incomes, the consumption of poultry meat increased only slightly with

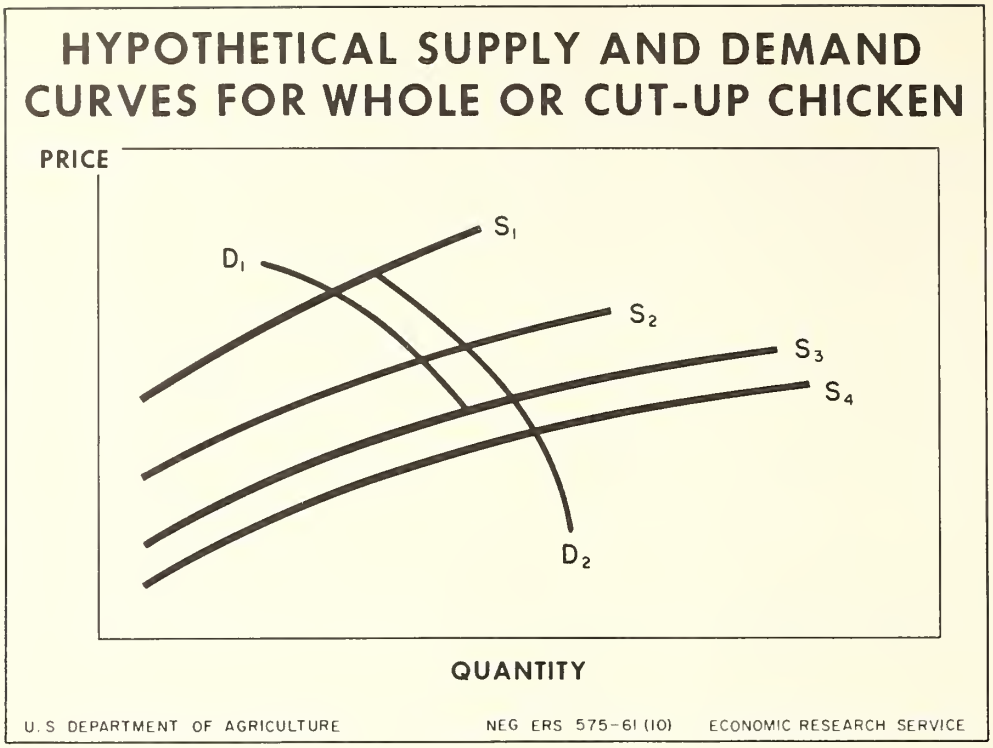

Figure 9

increased family income (11, p. 3). However, persons at high income levels tended to buy processed forms of poultry. Consumers who were influenced by the goal of a higher standard of living tended to buy processed forms or both processed and unprocessed forms (8, pp. 43-44).

Chicken was definitely a second-choice meat among both high- and middle-income groups. Only among low-income groups was chicken the preferred meat. Moreover, the more educated housewives were, the more likely that chicken was their second choice. This "educational rebound" may exist because beef is considered the "prestige meat" with chicken is the "poor man's delicacy" (1, pp. 3-4).

Many privately employed market analysts claim the poultry industry suffers from underconsumption of its products, but they usually define the opportunities for expanding consumption in terms of new products (7, 22, 2). For example, one report suggests only 2 families in 10 are real price buyers; another 2 families in 10 are motivated by habit; but the other 6 families want conveniences and new products they are not being offered now. Price buyers are using more poultry. Consumption is holding steady or increasing among the habit-dominated group, but for the remaining 6 families in 10, consumption is far below its potential (7).

However, the extent of diversion from the whole or cut-up forms to further-processed products may have a logical limit. The tremendous expansion in broiler consumption has come through the production and marketing of high-quality fresh-killed broilers on a year-round basis, and at increasingly favorable prices relative to most competing meats. Fresh-killed whole or cut-up broilers are already conveniently packaged and can be prepared quickly and easily in a variety of ways.

If the industry attempted a general shift to new product lines there might be a decrease in total requirements for broiler meat and in utilization of the industry's capacity to produce and market. Perhaps new product lines can play a more constructive role if applied in limited fashion, to help alleviate seasonal variations in prices and returns.

Figure 10 shows hypothetical demand curves for further-processed products and for whole or cut-up broilers. The segment of the assumed demand curve (D_1) for whole or cut-up forms is relatively inelastic. On the other hand, the segment of the assumed demand curve (D_2) for further-processed products is relatively elastic.

Point P_1 represents the present price for whole or cut-up broilers and Q_1 the quantity consumed. Point P_1' represents the present price for further-processed products using broilers and Q_1' the quantity consumed. Therefore, present consumer expenditures for broilers can be represented by the sum of /__/'s OP_1AQ_1 and $OP_1'A'Q_1'$.

Price points P_2 and P_2' help show consumers' annual expenditures when processors divert a portion of the September-December output from whole or cut-up forms to further-processed products. Point P_2 represents the higher price obtained for whole or cut-up broilers by reducing the quantity consumed from Q_1 to Q_2. Point P_2' shows the result of increasing the quantity consumed as further-processed products by a like amount, or from Q_1' to Q_2'. The modified consumer expenditures would be increased since the sum of /__/'s OP_2BQ_2 and $OP_2'B'Q_2'$ is greater than the sum of /__/'s OP_1AQ_1 and $OP_1'A'Q_1'$.

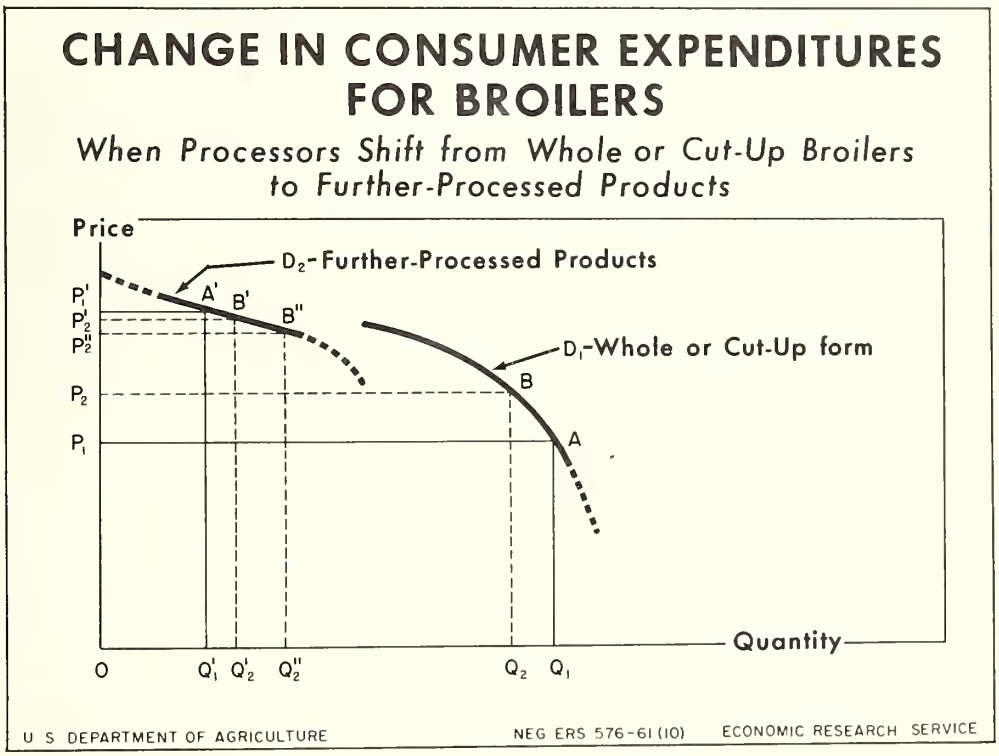

Figure 10

A small future increase in overall output might be most profitably consumed as further-processed products. With this expansion, the sum of $\square$'s OP_2BQ_2 and $OP_2''B''Q_2''$ would maximize consumer expenditures, given the slopes of the two demand curves shown in figure 10.

However, if the diversion to further-processed products is continued, a point will be reached where the demand for these products also becomes inelastic. Since further-processed products are a high "status" item with greater income elasticity, they do not appear to offer a mass-market potential equal to that for whole or cut-up broilers. Hence, the inelastic portion of the demand curve will be reached at a lower rate of per capita consumption.

Retail-store operators report that the price which consumers are willing to pay for broilers in whole or cut-up form has become highly institutionalized in recent years. This means, in effect, that consumers would become increasingly unwilling to pay higher and higher prices if quantities of whole or cut-up broilers are reduced. Evidence of this phenomenon can be found in the reactions of consumers when prices of whole ready-to-cook broilers exceed about 39 to 43 cents per pound in large supermarkets, and in the off-and-on purchasing which results when 29- to 33-cent "sales" prices and 39- to 43-cent prices prevail in alternate weeks. These forces define a limited area within which adjustment will produce additional revenue. If usual prices are further reduced, those new prices, too, will tend to become institutionalized.

Since the examples given in figure 10 measure expenditures at the consumer level, these must be translated to the processor level to tie them to the conclusions of this report. While prices to the consumer have declined over the last decade, the farm-to-retail price spread has remained relatively constant. So have the processor-to-retail price spreads. Thus, total returns at the processing level can be derived by deducting a constant spread per pound from retail values.

At the processing level, the difference between total returns and total costs, or net returns, is the measure which should guide processors in determining the optimum adjustment between selling in whole or cut-up versus further-processed product forms. Figure 11 shows the location of this point under hypothetical conditions. For a given total quantity of output, total costs will rise as the proportion sold in further-processed product form increases. On the other hand, because of declining prices per pound received for the further-processed products and the inability of institutionalized prices for the whole or cut-up form to rise indefinitely, total returns will eventually fall. These forces define the limited area within which the optimum combination of further-processed products and whole or cut-up broilers can be located. Processors would maximize net returns by diverting only a part of total output to further-processed products.

The results shown in this hypothetical analysis can be best realized by the exercise of prudence in determining total output under the relationships assumed. The gains to be realized by diverting a portion of a given total output could easily be lost by expanding total output too rapidly. Under these circumstances, future expansion, barring further technological breakthroughs, should be largely based upon: (1) the growth in the consuming population; and (2) a small rate of expansion in total output based on acceptable new products.

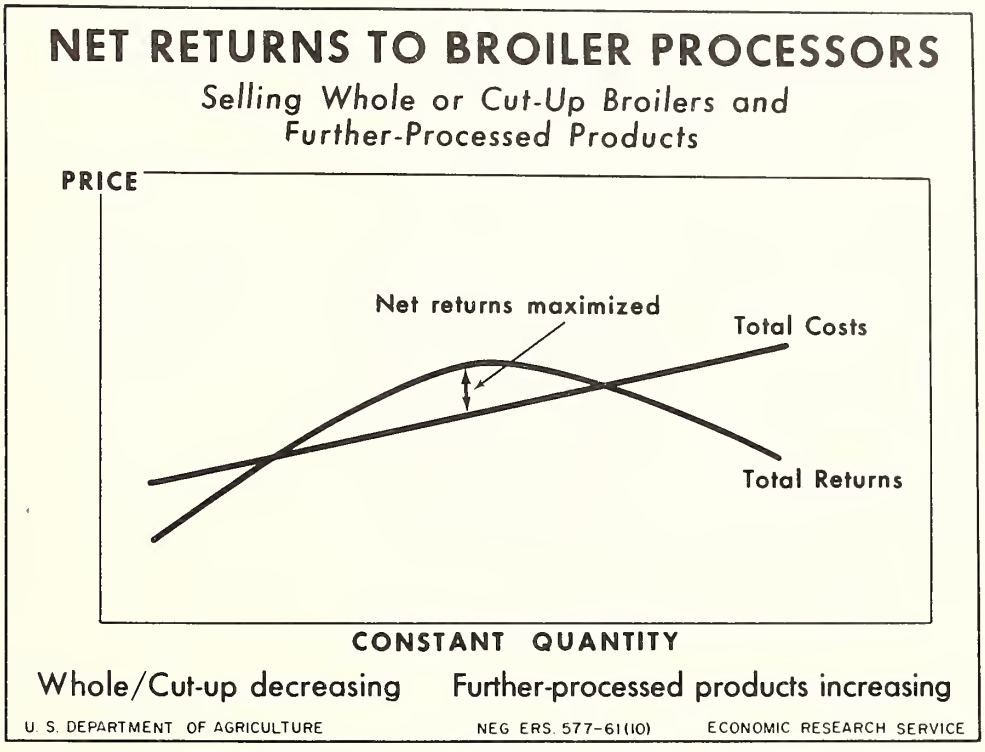

Figure 11

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Growth Through Agricultural Progress