FOREWORD

During the last decade, the topics of subsector organization and vertical coordination have become increasingly recognized as important factors in the organization and performance of the U.S. food system. However, little research has been conducted on these topics, in part because the methodology and conceptual framework for subsector analysis is not fully developed.

The North Central Regional Research Project NC-117 is examining the organization, coordination and performance of several commodity subsectors. Monograph 5 provided a comprehensive analysis of the U.S. dairy subsector. This volume provides a similar analysis of the U.S. egg subsector. Future monographs will analyze the beef and selected fruit and vegetable subsectors.

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THE EGG SUBSECTOR OF U.S. AGRICULTURE
A REVIEW OF ORGANIZATION AND PERFORMANCE

Lee F. Schrader, Henry E. Larzelere, George B. Rogers
and Alan D. Forker

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The study has benefited from reviews and suggestions from a number of people including Bruce W. Marion, Marvin L. Hayenga, Allan Rahn, Anthony P. Stemberger, and participants in a NC-117 workshop on vertical coordination at Madison, Wisconsin in early 1977 where an early draft of this report was reviewed.

PREFACE

The organization and coordination of many agricultural commodity subsectors have undergone significant changes in recent years. For a variety of reasons, some subsectors have moved from loosely organized arrays of small firms linked by spot markets toward more tightly organized systems frequently linked by contracts, vertical ownership or joint ventures. Large nonfarm firms play an increasingly important role in the control and coordination of many subsectors.

Changes in organization and coordination of subsectors particularly raise questions about:

1. The control of subsectors—regardless of the observable effects on performance, it is important to understand who has control over strategic aspects of a subsector and the degree, if any, that control is shifting.

2. The effects of alternative vertical organization and control patterns on subsector performance, particularly:
   a. The extent to which supply offerings match demand preferences regarding quantity, quality, timing, and location.
   b. Technical and operational efficiency of entire subsector.
   c. Equity of distribution of returns, risks, information and responsibilities.
   d. Access to subsector, including the widening or narrowing of markets, market foreclosure, vertical "squeezing" opportunities and the conditions of entry.
   e. The reliability and stability of subsector performance.

These are some of the concerns that led North Central Regional Project 117 to include the analysis of subsector organization and coordination as one of its principal areas of inquiry. The early work of this committee revealed two important obstacles that prevent answers to the above questions:

1. There is inadequate information on the organization of various commodity subsectors and the extent to which these have changed in recent years.

2. Subsector analysis is a relatively recent undertaking for economists. Although there are a variety of theories about firm and market behavior, there are no well-developed theories of subsector organization and performance.

In an effort to remove the first obstacle, several task forces were organized to develop comprehensive descriptive reports on selected subsectors.
This is the second of such reports. It attempts to summarize what is known about the organization, coordination, and performance of the egg subsector. A previous report examined the dairy subsector. Future reports will review the beef, and fruit and vegetable subsectors.

ANALYTICAL FRAMEWORK

For this report, an agricultural subsector is viewed as an interdependent array of organizations, resources, laws, and institutions involved in producing, processing, and distributing an agricultural commodity. A subsector normally includes several industries (firms that are similar in functions performed and products produced), such as the egg packing or the food retailing industries. Subsector analysis is more than an analysis of the various industries that are part of a subsector, however. Although such industry analyses may be useful, the essential characteristic of subsector analysis is focusing on the total vertical complex as a system.

Viewed as a system, a subsector is analogous to a pipeline with inlets, outlets, and valves; or, assembly line in which functions are performed and value added at several succeeding stages. This view focuses attention on the total vertical value adding process leading to the final products of the subsector, on control of critical parts of the subsector, and on the coordination needed to integrate efficiently the contributions of each stage and to ensure that what comes off the end of the assembly line is in fact what is demanded.

Efforts by NC-117 researchers to develop a conceptual framework for subsector analysis have met with modest success. Henderson and Marion (14, 21) have attempted to adopt the structure-conduct-performance paradigm of industrial organization theory to subsector analysis. Figure 1 is one result of these efforts. This is the general framework and classification scheme that has been used by the task force which produced this report as well as by other NC 117 subsector task forces. Although Figure 1 suggests certain causal relationships, the testing of these relationships will largely occur in future research. Although the present report may provide clues to such relationships, it is primarily intended to lay the groundwork for future analysis of subsector organization-performance relationships.
INTRODUCTION

The egg subsector is particularly interesting as a subject for a subsector analysis. It is a relatively simple system with little change in product form and relatively few stages of production. The subsector serves as a model of efficiency with real (deflated) retail prices much lower today than 25 years ago. The subsector has also experienced a substantial reorganization during the post World War II period. Coordination has been concentrated through integration and contracting with production moving to large specialized units to a substantial degree.

The same innovations in technology and organization have had a cost in terms of virtual destruction of traditional pricing processes and, to some extent, in terms of access and control in the hands of the traditional farmer. Some might argue that the traditional farmer has all but disappeared from the subsector. The interaction of technological change and organizational change and the way in which this interaction affects the performance of the subsector are the fascinating aspects of analysis.

This study represents a synthesis of and interpretation of existing data and research results. The review is somewhat uneven because information regarding the several aspects of the subsector varies in volume and in depth. Consequently, the reader should not infer that brief treatment of a topic implies the authors' judgment that the topic is not important.

The study is focused on the organization and performance of the subsector as it exists at present and on the forces which are expected to cause it to change. Where historical perspective is needed the analysis is generally limited to the post World War II period.

The presentation includes three major sections. The first of these provides a description of the nature of the commodity, eggs. The nature of the commodity represents the physical dimension of the system.

The second section includes analysis of the structure and coordination of the subsector. The production and market stages are identified and described and the market structure at each level of the system is discussed. The nature of the coordination process and of the coordination mechanisms used in the subsector are analyzed.

The third section includes analysis of the performance of the subsector as well as identification of factors expected to influence the direction of change in the organization and control of the subsector in the future.

NATURE OF THE COMMODITY

Production of eggs for all uses is one of the few aspects of the subsector which has not been subject to major change during the past 30 years. The level of total production has changed little during the period. Average production during the 1950-54 period was 4,865 million dozen and, in 1973-77, production averaged 5,422 million dozen.

These data include eggs produced for hatching of broilers and layer replacements as well as those produced for food uses. There is normally some diversion of excess eggs produced for hatching into the food (market) egg channel. Estimates of market egg production represent total egg production less estimated use of eggs for hatching.

Market egg production in the United States over the last 30 years (Figure 2) has fluctuated between 4.9 and 5.5 billion dozen per year. The range since 1965 has been between 5.0 and 5.5 billion dozen, compared with ranges of 5.0 to 5.3 for the period 1955-64 and 4.9 to 5.2 for the 1945-54 period. On the average, market egg production has increased only about 0.1 billion dozen eggs in each succeeding decade, indicating a virtually stable average supply, despite the substantial growth in U.S. population.

GEOGRAPHIC DISTRIBUTION OF PRODUCTION

Drastic shifts in the location of egg production belie the stability which might be inferred from the national production data. Regional shares and shifts in production are presented in Table 1. Regional egg supply as a percent of estimated regional use is shown in Table 2. For many years prior to the 1960's, the West North Central region was the only region which produced a net surplus of eggs over its own require-

Table 1. Regional shares of production for eggs, selected years, 1950-77

<table>
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<th>Region</th>
<th>1950</th>
<th>1964</th>
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Table 2. Regional egg supply as percentage of total regional consumption, selected years

<table>
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<tr>
<th>Year</th>
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<th>South Central</th>
<th>South Atlantic</th>
<th>Mountain</th>
<th>Pacific</th>
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<tbody>
<tr>
<td>1955</td>
<td>75%</td>
<td>71%</td>
<td>97%</td>
<td>90%</td>
<td>83%</td>
</tr>
<tr>
<td>1960</td>
<td>72%</td>
<td>65%</td>
<td>89%</td>
<td>90%</td>
<td>83%</td>
</tr>
<tr>
<td>1965</td>
<td>77%</td>
<td>60%</td>
<td>80%</td>
<td>90%</td>
<td>83%</td>
</tr>
<tr>
<td>1970</td>
<td>80%</td>
<td>53%</td>
<td>73%</td>
<td>90%</td>
<td>83%</td>
</tr>
<tr>
<td>1975</td>
<td>86%</td>
<td>55%</td>
<td>73%</td>
<td>90%</td>
<td>83%</td>
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</tbody>
</table>

Source: USDA, Statistical Reporting Service.

Table 2 continued:

<table>
<thead>
<tr>
<th>Year</th>
<th>East</th>
<th>South Central</th>
<th>South Atlantic</th>
<th>Mountain</th>
<th>Pacific</th>
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<tbody>
<tr>
<td>1955</td>
<td>75%</td>
<td>71%</td>
<td>97%</td>
<td>90%</td>
<td>83%</td>
</tr>
<tr>
<td>1960</td>
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<td>65%</td>
<td>89%</td>
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<td>1965</td>
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<td>1970</td>
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<td>73%</td>
<td>90%</td>
<td>83%</td>
</tr>
<tr>
<td>1975</td>
<td>86%</td>
<td>55%</td>
<td>73%</td>
<td>90%</td>
<td>83%</td>
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</table>

ments. Thus, that region was the major shipper of both shell eggs and processed eggs to other regions. Smaller interregional movements of shell eggs occurred between some other regions to even-out seasonal surpluses and deficits; to market breaking eggs; to satisfy requirements for particular grades, sizes, and shell colors; and because of long-established business relationships. Some of these movements still occur today, despite the changes in regional surplus-deficit positions (37).

Continuing trends which started somewhat earlier, the shares of U.S. output of market eggs coming from the North Atlantic, East North Central, and West North Central regions declined through the 1960's. The shares of total output from the South Atlantic, South Central, and Pacific regions continued to rise. And, as these latter regions became surplus producers of shell eggs in the 1960's, they increasingly replaced the West North Central region as a supplier to other regions. Thus, more and more eggs from the South moved to the Northeast and Midwest and from the Pacific Coast eastward to the Mountain region and beyond. Despite the upward trends in egg products production in all other regions over the last two decades, the West North Central region was the only surplus producer of processed eggs through the 1960's.

The shares of the U.S. output of shell eggs from most regions tended to stabilize in the 1970's. The movements of shell eggs from the Pacific region became more restricted geographically, New England became virtually self-sufficient, and there were indications of a small increase in the West North Central region's share of shell egg output. The Pacific region produced a small surplus of processed eggs by the mid-1970's, and output of processed eggs continued to grow in deficit regions.

Currently, less than a fifth of the shell eggs move between geographic regions compared with more than a fourth of the processed eggs.

CONSUMPTION OF EGGS AND EGG PRODUCTS

ALTERNATIVE USES AND CHANGES IN CONSUMPTION

Eggs reach the consumer directly as shell eggs and indirectly through food service institutions or as an ingredient in other manufactured food products. Institutions and food manufacturers often buy eggs in the liquid, frozen or dried forms. Manufactured foods contain relatively small amounts of eggs or egg products, and the identity of the egg product is lost at that point. Bakers and bakery mix manufacturers are major users of dried egg products. Frozen and liquid egg products are used by institutions and by manufacturers of frozen or prepared products including confectionary products, mayonnaise and convenience foods.

Civilian per capita consumption of all eggs has trended downward from its all-time peak of 403 eggs in 1945, dropping below 365 in 1957, and under 300 by 1973 to the 1976 level of 276 eggs per capita (Figure 3).
The decrease in per capita consumption has been almost entirely because of declining consumption of shell eggs, inasmuch as per capita consumption of processed eggs has trended irregularly upward. Per capita use of processed eggs was 25.5 in 1945-54, 28 in 1955-64, 33 in 1965-74, and 32 in 1975-76.

The decrease in per capita use of eggs has been a major concern of the industry for a number of years. The reasons for the decline are not clear. For more than a decade eggs have been one of the commodities surrounded by medical controversies relating to the effects of dietary fat and cholesterol on human health.

While the fat-cholesterol controversy has probably exerted a negative influence on egg demand, most of the long-time downward trend in egg consumption probably results from other forces. Since eggs have not been very widely used as a main dish item at lunch or dinner, a principal cause has been the decline in the use of eggs at breakfast. This results from less time being allocated to breakfast, post-breakfast snacks, the supposition that eggs may be less convenient to prepare, reduced caloric needs with less physical labor, and changed preferences in certain age groups. Cereal-based convenience items appear to have been the chief beneficiary of these shifts; and, hence have been the principal substitutes for eggs for weekday breakfasts. Eggs, along with items like bacon, ham, or sausage are used more frequently for weekend breakfasts than on weekday days.

The decrease in use of eggs is all the more dramatic because the price of eggs relative to most other items fell during much of this period. The average retail price for grade A large eggs (1967 dollars) was 64.6 cents per dozen in 1960 and 49.3 cents in 1976.

SUBSTITUTES

Eggs are a relatively unique item, both as an ingredient in prepared foods and as a main dish. Eggs are a major protein source and would be expected to be considered in a class with dairy products and meats. Formal demand analysis, however, does not reveal a close relationship to any single commodity or group of commodities.

Particularly in the 1970's there has been an expansion of the volume and number of so-called egg substitutes for home use. These products (designed to be low fat or low cholesterol) are mostly frozen, dried or refrigerated mixes with a natural egg white base and a synthetic yolk. While some of these have convenience attributes, they are mainly designed to be part of a low cholesterol diet. Some argue that such products detract from aggregate egg demand while others maintain that they use egg products and contribute to total demand since the substitute user might otherwise use no eggs at all. The total volume of egg substitutes manufactured and sold is believed to be a minor amount in relation to total egg consumption. Informal trade estimates indicate that 25 percent of egg albumen produced in egg products manufacture may be used in egg substitute products. If correct, these products may represent about 3 percent of the total egg market.

Soybean protein products have replaced eggs in bakery mixes to some extent. During periods of high egg and egg product prices product formulations are reviewed and new products replacing eggs are tried. If successful, these substitutions are seldom reversed and, as a result, the rate of egg use in such products has tended to decline over time. Use of egg products has probably not kept pace with growth in manufactured foods which contain eggs. Thus, the substitution of purchased mixes and prepared foods for home prepared items has been a factor in reduced use of all eggs.

PRICE, INCOME AND CROSS ELASTICITIES OF DEMAND

The quantity of eggs consumed is generally recognized as being relatively unresponsive to changes in the price of eggs, prices of other products and consumer income. Data presented earlier indicate clearly that the demand for eggs has shifted downward over time. There is also evidence that the demand for eggs may be, on the average, more price inelastic than formerly, with a given change in quantity now associated with a larger change in price. Price elasticity of demand also is believed to become successively lower from the retail to the wholesale and to the farm level. That is, farm prices vary proportionately more in relation to quantity changes than do those at the wholesale and retail levels. Various studies suggest that income elasticity ranges from a small positive to a small negative value (small increase or decrease in egg consumption with higher income), and cross elasticities between other commodities and eggs are positive but small (higher prices for other items increase egg consumption).

A recent analysis (15) updated the estimates of price and income elasticities from an earlier study (2). The original set of elasticities was calculated using September 1955-August 1967 data, and the updated set from January 1964-December 1975 data. Both sets of estimates place annual shell egg price elasticities (wholesale price level) in the -.20 to -.24 range with monthly values ranging from .04-.06 above and below the annual coefficients. But the responsiveness of demand for eggs for commercial breaking eggs declined very substantially from that of the earlier period. The more recent analysis indicated an annual price elasticity of about -.8 (with monthly values ranging from about .4 above and below) compared to an annual elasticity of -.2 in the earlier period. Estimated income elasticities (percent quantity change for a 1 percent increase in real per capita income) were 0.7 for the earlier period and
0.4 for the most recent period. Corresponding values for breaking eggs were 5.6 and 1.1.

Analyses based on 1958-62 Atlanta consumer panel data indicated quantity purchased income elasticities of +0.21 for all eggs, +0.50 for large eggs and -0.02 for small and medium eggs. Expenditure income elasticities were +0.26 for all eggs, +0.50 for large eggs, and -0.014 for small and medium eggs. Purchase of and expenditures for eggs attained a maximum with income at about $6,000 (1958-62). Quantity purchased household size elasticities were +0.59 for all eggs, +0.34 for large eggs, and +0.93 for small and medium eggs. Expenditure household size elasticities were +0.56 for all eggs, +0.31 for large eggs, and +0.88 for small and medium eggs (27).

Retail income elasticity for eggs was reported in another study as close to zero (-0.076 to +0.055 by weighted regression vs. log difference equations). The coefficient associated with household size, with quantity as the dependent variable was positive, but negative with expenditure as the dependent variable. Cross elasticities (retail prices of other commodities in relation to egg consumption) were virtually all positive, but most were below +0.015. The price elasticity of demand for eggs at retail was estimated to be -0.32, and price elasticity at the farm level -0.23, using an elasticity of price transmission from the retail to farm level of .71 (10).

The many studies which have been made of consumption patterns and demand for eggs have often reached conflicting conclusions. Survey, cross section and panel data also often delineate consumption characteristics which are only partially recognized in formal mathematical models or subsumed by inference under a limited number of variables. Yet some of these characteristics may be vital to any program which seeks to halt or reverse the long-time downward trend in per capita consumption of eggs. Among these are: rate of use of eggs at breakfast and other meals, ways in which eggs are prepared, convenience attributes, eating habits of various age and ethnic groups, rural vs. urban rates of use, employment in manufacturing, service, and professional occupation vs. heavier physical work occupations, dietary considerations, nutritional education and practices, perceived price relationships, growth of away-from-home eating, ratio of males to females, and family and household size (15).

Many demand studies also derive national level aggregate relationships which obscure geographic variations in demand. One study built upon consumer panel data, and used population estimates plus socio-economic characteristics of populations to measure and project regional and individual market consumption levels (28). These varied widely between regions and markets.

Price Patterns

Eggs, a perishable product facing an inelastic demand, display the expected highly variable price pattern. With a pronounced seasonal variation, within-year price variation is usually larger than between-year variation. The annual average of monthly average New York wholesale prices with range of monthly averages for the 1955-76 period are shown in Figure 4.

Geographic price patterns reflect regional surplus Deficit status and the cost of moving eggs between regions. The data are incomplete, and, at times, in conflict. One would expect wholesale prices (prices to retailers) to most nearly reflect these costs and movements. Yet the highest price to retailers among the 13 markets reported by USDA Market News was in Jackson, Mississippi (a surplus area) in 1976. A recent study of price spreads (5) indicates the following ranking of selected cities from highest to lowest retail egg prices during the 1971-76 period: Boston, New York, Baltimore, Washington, Atlanta, Cleveland, Chicago, St. Louis, Los Angeles, San Francisco and Seattle. The nature of local marketing channels, selling strategies, level of costs and competitive conditions are factors which cause price spreads between retail and producer prices to vary among regions. Random year-to-year or within-year variations in commodity pricing patterns can occur because of variations in producer response patterns, shifts in surplus Deficit balances, or exogeneous events.

In general, eggs move in a national market and an egg is an egg regardless of origin. A strong New England preference for brown shelled eggs is an exception. Brown shelled eggs command a premium of about 2 cents per dozen in the Boston market, whereas they are virtually unknown in most of the rest of the U.S.

Egg prices exhibit a pronounced seasonal pattern with the seasonal low occurring in May and the high in September or December. The pattern appears to have shifted from a September to a December high in recent years. The pattern originated from highly seasonal production with heavy production in the spring and low production in the fall and winter. For example, during the 1951-55 period egg production in March averaged 1.46 times output in September, whereas, in 1971-75 March output averaged only 1.09 times that in September. The trend toward light and temperature-controlled housing has been a major factor in the reduced seasonal variation in production. Despite the fact that seasonal variation in egg output is now lower, a seasonal pattern persists with substantial within-year variation not explained by the average seasonal. These variations reflect seasonal demand shifts, changes in general level of production and, perhaps, imperfections in the pricing system.

For many years, egg price cycles of about 3 years' duration seemed
to occur with some regularity. Such a mix of good, in-between, and bad years still happens. This reflects the inability of the industry to achieve stability of output and prices through the accumulation of individual decisions. The net returns resulting from price peaks and troughs are often accentuated through coincidence with other commodity cycles, more volatile feed prices, and changes in general business conditions. Further discussion of cycles is included in the analysis of subsector performance.

**IMPORTANCE OF INTERNATIONAL TRADE AND WORLD MARKETS**

The United States produces about 21 percent of the world's egg supply compared to 21 percent in the European Community, 19 percent in the U.S.S.R., and 10 percent in Japan (29). While China is the second largest egg producing country, the European Economic Community, principally the Benelux countries, and Eastern Europe are by far the major egg exporting areas in terms of quantities. About 3.3 percent of the world production of 290 billion eggs (excluding China), move in export. Only the EC as a whole, and the Eastern European areas plus Australia consistently export substantially larger percentages of output, with the Benelux countries close to 50 percent. West Germany is by far the largest importer of eggs, followed by Japan, Hong Kong, the United Kingdom, U.S.S.R., and Switzerland. Many countries are tending to become more nearly self-sufficient in egg production, in relation to their current rates of consumption (42).

The United States has not played a major role in foreign trade of eggs in peacetime. Over the last three decades, exports and shipments have been many times larger than imports. Only during wartime and when large shipments overseas were made from Government stocks and for relief feeding, have exports reached 3 to 14 percent of output. Generally, net exports are less than 1 percent of output. There is some movement of eggs to and from Canada, and shipments to U.S. territories.

World per capita consumption of eggs has increased 10 percent since 1965. The largest increase has been in the centrally planned economy countries (25%) and in the developing countries (18%), compared to only 9 percent for the developed countries. However the present rate of consumption in the centrally planned economy countries is about half that in the developed countries, with consumption in the developing countries only 15 percent of that in the developed countries. Per capita consumption in North America has declined 9 percent since 1965, mainly due to the drop in the U.S. Currently, Israel, West Germany, Japan, and probably Canada have higher rates of per capita consumption than the U.S., and Oceania is close to the U.S. rate. Many countries of Western Europe, plus the U.S.S.R., consume more than 200 eggs per capita per year.
SUBSECTOR ORGANIZATION
PRODUCTION AND MARKETING CHANNELS

STAGES AND FUNCTIONS AT EACH STAGE

Understanding the stages of production in a subsector and the relationship of those stages to each other and to organizations outside the subsector is fundamental to the analysis of its organization and performance. Following Mighell and Jones (22) a stage is defined as a set of activities or transformations which could yield an identifiable product which could represent a pricing point in the subsector. A graphic representation of the major stages and supporting activities in the egg subsector is presented in Figure 5.

The basic breeding stage is a research-oriented genetics-based activity. The observed products are either day-old “parent stock” chicks or hatching eggs to produce parent stock.

The day-old chick is grown to production age (6 months) and used to produce hatching eggs for about 12 months at the hatching egg production stage. At this stage feed is a major input and cost factor. Feed is also a major input at subsequent grow-out and production stages.

The hatching eggs are used at the hatchery stage where the product is day-old pullet chicks destined for market egg production. The day-old pullets are then grown to production age (20-24 weeks) at the grow-out stage. The product is a ready-to-lay pullet.

These pullets enter the egg production stage where they remain in production for 12 to 15 months in a single cycle system or for periods of 2 years or more if periodically force molted. The major product is market eggs, but the retired layers (spent hens) enter the fowl processing stage for slaughter and marketing.

Eggs move either to egg products manufacture (breaker) or to an assembler-packer. The products of breaking are liquid, frozen or dried egg products which move into either food service or into the manufacturing of other food products. The assembler-packer stage includes assembly (if necessary), sizing, grading and packing eggs. Eggs move into retail in cartons or to food service establishments packed loose in cases. Surplus and undergrade eggs from packers go to breakers.

A wholesale distribution function exists between the packing and retailing stages or other outlets for graded and sized eggs. This stage involves the distribution of packed eggs to stores and institutions. In some cases a broker may also be involved at this level.

Suppliers of production houses and equipment, hatching equipment, processing equipment, packaging, etc. are grouped to simplify the figure. A number of industries are involved; and the group does repre-
sent a major input to the subsector with important influence upon its performance.

Excess eggs produced for broiler and egg-type chicken hatching enter the market egg channel at the assembler-packer level. Spent layers from the hatching egg flocks also enter the fowl processing stage of the subsector.

The egg subsector has undergone widespread changes throughout its long history. In earliest times it was common practice for many egg producers to be directly involved with hatching and brooding chicks, mixing feed, selling live or dressed surplus cockerels and pullets as well as spent hens, medicating flocks, building equipment and houses, and carrying out much direct marketing of eggs to consumers and to stores. The basic breeding function, as known today, did not exist. Where surpluses developed, the eggs were often shipped long distances. The producer to consumer channels were typically long and complex in these surplus producing areas.

As egg production unit sizes increased and egg production emerged as a specialized rather than a general farm enterprise, specialization increased in the input-supplying and marketing activities; and egg producers and marketing firms became more dependent upon distant markets. Most of the breeding and hatching, feed mixing, medication, equipment manufacturing, and building functions, along with poultry dressing and egg packing became associated with larger and more specialized nonfarm firms. A stage which included assembly of eggs from farms and shipment to packers located near consuming areas emerged. Egg packing has moved away from consuming areas toward production areas during the past three decades; and the assembler-shipper function has virtually disappeared. The assembly function has been integrated into the packing stage.

STRUCTURE OF THE SUBSECTOR

No particular combination of the several stages either by ownership or contract dominates the vertical structure of the egg subsector. Typical ownership combinations of stages are illustrated in Figure 6. The same stages may be jointly controlled through contracts. The stages which dominate or typically form the base for firms operating at more than one stage are also noted on Figure 6. The role of the feed manufacturing stage cannot be shown on the diagram but is often a part of multi-stage firms including market egg production.

THE BREEDER. Firms engaged in breeding of White Leghorns (egg-type chickens) are generally not involved as owners at other stages in the subsector. One firm which owns a breeder operation is involved in several other stages of the subsector; however, the breeder function is operated

**Figure 6. Illustration of stage combinations in single firms typical of the U.S. egg subsector.**

<table>
<thead>
<tr>
<th>BASIC</th>
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<tbody>
<tr>
<td>BREEDING</td>
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<td>RETAIL</td>
</tr>
<tr>
<td>SALES</td>
</tr>
</tbody>
</table>

Vertical lines indicate stages included in single firm. Arrows point to the stage which forms the base of the integrated activity.

as a separate entity. The breeder stage represents a research-oriented genetics-based activity.

The specialized breeder emerged as a separate stage in the late 1940's and early 1950's as hybridization replaced simple selection on the "record of performance" system. Before the emergence of the separate
breeder stage, hatcheries maintained and selected from their own lines with varying degrees of success. The more successful of these early hatcherymen-breeders became specialized breeders as more and more capital and specialized knowledge was necessary to remain competitive.

Most of these early breeders were sole proprietorships or small family operations and lacked the capital to finance hatchery expansion needed to keep pace with the breeder stage. As a result they began to franchise other hatcheries to produce hatching eggs and commercial chicks. The number of firms at the breeder stage has been declining almost since its inception as a recognizable stage until the present when the five largest breeders account for 80 to 90 percent of total breeder pullets (parent stock) placed in the United States. Two of the five, DeKalb and Hyline (Pioneer), were also engaged in the production of hybrid corn and both firms grew to be relatively large public corporations. One of the early leaders (Kimber) has been absorbed by DeKalb. The remaining three have been acquired by other much larger firms (Shaver by Cargill, H and N by Pfizer and Babcock by A. H. Robins Co.). Babcock was the last to be acquired but had gone public and diversified into swine breeding prior to being acquired by Robins in 1978. A European strain, Hixac, is gaining a significant share of the U.S. market.

**HATCHING EGG PRODUCTION.** Although hatching egg production could exist as a separate market coordinated firm it is nearly always owned by or operated under contract to a hatchery operation. The number and size of hatching egg production units is a function of the number and size of hatcheries. The total number of layers in hatching egg supply flocks is estimated to be about 4 million and the units are small relative to market egg production units.

Contract producers generally provide house, equipment, utilities and care for the breeder flock. Ownership of the flock and the hatching eggs remains with the hatchery and the producer is paid on the basis of the number of birds or eggs produced.

There is some trading of hatching eggs among hatcheries. At times this clearing of hatching egg supplies is facilitated by the breeder.

**HATCHING AND PULLET GROWING.** There were 797 chick hatcheries in the U.S. in 1975, down from 5,945 in 1957 and 2,365 in 1965. Total egg capacity has declined and average hatchery capacity has increased more than fivefold since 1957. Probably two-thirds of the chick hatcheries produce egg-type chicks, although many of them also hatch broiler chicks.

Hatcheries are generally franchised by one of the breeders, and in most cases hatch only one strain of egg-type chick. The trend has been toward more multiple-strain hatcheries, particularly when the hatchery is part of an integrated egg production organization.

As the egg subsector evolved toward specialized egg production firms many producers chose to buy ready-to-lay pullets (20 to 24 weeks old) rather than day-old chicks to be raised on the farm. This led to aggressive hatchery firms into the pullet growing stage through ownership and perhaps to a somewhat greater extent through contracts with specialized pullet growers.

A number of hatchery firms have extended their operations into market egg production, usually by contracting. This is often accomplished via a three-way arrangement with a feed manufacturer or dealer and a producer. The hatchery function has been made a part of several very large integrated egg production and marketing operations.

The relevant market for chicks and started pullets is primarily regional with some effort on the part of breeders to assign territories to hatcheries. Both chicks and pullets are moved long distances when short term regional imbalances occur.

There are a large number of pullet producers but few operate as a single-stage firm unless under contract to either a hatchery or egg production entity. A few large multi-plant pullet growers buy chicks and sell pullets accepting the full risk of production. Contracts are generally for housing and care with feed, medication, other services and the chick provided by the contractor. Payment is generally on a per pullet raise basis with performance incentives.

**FEED MANUFACTURE.** There are nearly 10,000 feed mills in the U.S. About 4,800 manufacture primary feed (individual ingredients plus a premix at the rate of 100 pounds per ton). The remaining 5,200 produce feed for mixing with one or more ingredients and about 300 pounds of a formula feed supplement per ton. Some farmers also mix feed on their own premises. FDA indicates 9,461 feed mills that manufacture or mix animal feeds that contain drugs, with several hundred other mills that do not have to register with FDA. Such mills produce feed for sale, feed for integrated poultry operations, or are part of large scale livestock feeding operations. Formula feed is distributed through about 20,000 feed dealers, accounting for 60 percent of retail sales. The balance is from direct-selling feed organizations or large feeder-dealers (23). Because egg production is common to all states, probably 40 to 50 percent of the feed mills and dealers handle egg-type feeds to some extent. But there are probably a few hundred integrated mills that produce only layer or pullet feeds.

The relevant market for feed is local or sub-state; but because of the large number of mills capable of manufacturing chicken feed the feed buyer ordinarily has a number of alternative sources of feed. The chicken feed buyer in an area of low concentration of egg production may, of course, have fewer alternatives than a buyer in an area of heavy con-
centrations. Larger producers can often band together to buy in quantity advantageously or contract for custom mixing services.

Like hatcheries, feed manufacturing operations are involved with pullet growing and market egg production both as a part of the same firm or as a contractor. In the contract situation the feed firm is generally the initiator and the major risk bearer. When combined with other stages in a single firm the feed stage may be either dominant (egg production small relative to feed production) or in a service role in the very large egg production and marketing firm.

**Equipment and Supplies.** The diverse group of functions depicted on the stage diagram as equipment and supplies involves a number of industries. Suppliers of equipment and packaging materials are divisions of very large firms in the machinery and packaging industries in several cases. The number of firms is typically quite small with four or five accounting for a major share of the business. The market for these inputs is national and aggressively competitive. Building materials and construction are provided by local firms in many cases and the number of firms supplying the egg subsector on a national basis is quite large. Firms in this equipment and supplies group typically are not engaged in other stages of the subsector either through ownership or contract.

**Egg Production.** The primary product of the subsector, market eggs, emerges at the production stage. The production function is the traditional farm stage and includes the largest number of firms of the several stages. The number of farms producing market eggs has been declining rapidly for two decades. Between 1964 and 1969, the number of farms with laying birds declined more than 60 percent. The rate of decline from 1969 to 1974 slowed somewhat. Census data for 1974 indicate that the number of farms with market egg birds has dropped about 32 percent from 1969 levels. About 300,000 farms reported market egg flocks in 1974. More than 94 percent of these farms had fewer than 3,200 birds and accounted for about 7 percent of egg production.

Prior to 1969 the number of egg producing farms in size categories of 10,000 birds per farm larger had been increasing while the number of smaller farms declined. In the 5 years ending in 1974 the number of farms declined in categories up to 20,000 birds. Multiple farm firms are common. The largest 20 firms engaged in egg production accounted for an estimated 17.9 percent of total egg production on 1,092 farms (0.55 percent of all farms) in 1974-75 (34). These figures include all farms for which the firm owned the hens, as such, may include many contract operations.

A more recent survey (1) identifies the largest 34 egg production companies and concludes that these companies have 25 percent of U.S. layers. This suggests a somewhat higher concentration than evidenced by the 1974 data; however, the data are not strictly comparable. Probably over four-fifths of the farms are noncommercial units in the sense that they produce only for their own and neighborhood needs, and account for about 6 percent of the volume. Another 10 percent or more of the farms with over 8 percent of the volume could be called small and independent direct marketing producers or residual farm flocks from earlier times whose eggs are marginal supplies to commercial channels. The remaining less than 6 percent of the farms with about 85 percent of the volume are large commercial flocks or contract flocks tied to large firms. The geographic dimensions over which these groups market expand drastically toward the fully commercial end of the scale. Many large firms operate in more than one state.

During the 1970's, the proportion of egg production coming from large-scale owner-integrated operations rose from 20 to 35 percent. Contract production rose from 20 to 45 percent. These resource-providing contracts, which involve feed manufacturers, feed dealers, hatcheries and egg assembler-packers, have replaced marketing agreement arrangements, which fell from 15 to 8 percent, and largely unintegrated production which declined from 45 to 12 percent. Owner-integration and contract production rose from minor status in the mid-1950's to significant influence by the late 1960's. Integration and contract production were common in new areas and increased with the rapid emergence of the South and West as the most important egg producing regions (35). The subsequent introduction of larger units and integration of production which replaced the very small flocks in the Midwest and Northeast have probably played major roles in stopping the decline of production in these areas.

There are some important regional differences in the extent of contract production and owner-integration. About three-fourths of the production in the Western region is of the owner-integrated type, and contract production, at well under one-tenth, is not a major influence. In the other regions, the owner-integrated proportion ranges from under a fifth in the West North Central region to under two-fifths in the North Atlantic region.

On the other hand, contract production accounts for about two-fifths of production in the North Atlantic and East North Central regions, about half in the West North Central region, and under three-fifths in the South. The relative rate of increase in contract production in the West North Central region has been the most spectacular of any of the changes during the 1970's. Both owner-integrated and contract production systems have been including packing and distributing to an increasing extent.

At the time of the 1971 Special Census on Poultry, the three most
common methods of payment under egg production contracts were, in order, minimum amount (per dozen), specified amount per bird or per thousand birds, and (payments based on) feed conversion. But the relative importance of these varied by regions. In such contracts, feed and birds were typically provided, sometimes with some other inputs and services, and flock supervision was generally exercised by the contractor. Other kinds of contractual arrangements existed, including some where returns were tied to market prices or where profits were shared by formula. A recent study (40) suggested that the same reasons exist for contracting as earlier: added capital availability or risk transfer by the producer, as an outlet for feed or birds, or access to a share of profits for the contractor. Another reason for the contractor is a guaranteed egg supply to market. The above study noted a tendency for recent contracts to provide for feed price variation, for percentage-of-receipt contract payment rates to decline with higher costs and prices, and for some anticipation of upward adjustments in payment rates as new building occurs at higher costs. There may also be a trend toward some variant of a profit-sharing agreement above a minimum rate, or even toward full profit-sharing or joint venture status.

The relevant market for the output of an independent producer is local. In areas of relatively high egg production concentration the producer may have a number of alternatives while in less concentrated areas there may be few alternatives. The same situation applies to the contract producer who may face many or few alternative contracts depending upon his location.

**The Flow of Market Eggs.** A brief discussion of the flow of market eggs from producer to consumer will facilitate the understanding of relationships between the stages to be treated in greater detail later. The market egg flow is shown graphically as Figure 7. Egg packing plants are the most important first receiver of eggs from production operations, accounting for almost three-fourths of the volume. Retail outlets, institutions and consumers receive relatively small amounts direct from producers. The wholesale distributor function does not correspond exactly to the similarly named stage. In this instance the wholesale distributor firm is a combination of the packing and wholesale distribution functions as well as a residual category for firms performing a variety of functions.

Breakers and dryers receive eggs from packing plants, wholesale distributors and producers with processed egg production using about 12 percent of total output. In addition to direct receipts from producers, wholesale distributors receive 10 percent of the eggs from packing plants, and handle 17 percent of total volume. Institutions obtain eggs from packing plants and from wholesale distributors, as well as pro-
ducers for a total of 17 percent. Retail outlets (stores and warehouses) receive 49 percent of the eggs from packing plants and 11 percent from wholesale distributors for a total of 67 percent of all market eggs.

Virtually all of the eggs going through marketing channels to consumers, institutions, or breakers are graded for size and/or quality in some fashion, and sometimes more than once. Eggs going from producers to breakers are packed loose (in cases with filler flats or on racks), as are those going to packing plants, wholesale distributors, and many of those going to institutions. Most of the eggs going from packing plants and wholesale distributors to institutions are packed loose in cases. Virtually all of the eggs going to retailers from producers, packing plants and wholesale distributors are cartoned, as are nearly all of the producer-to-consumer sales and some of the smaller producer-to-institution sales. These data are based on an establishment classification and, as such, do not represent a clean break by function or by firm.

Assembly-Packing. Egg packing plants have declined substantially in number over the last two decades and increased in size. In the late 1950’s, a national survey identified more than 15,000 egg handlers (8). Probably most of these were involved to some extent in packing eggs. By early 1976, Agricultural Marketing Service listed 4,394 producer-packers and grading stations under the shell egg inspection program. Of the egg packing plants, about 330 were under continuous inspection, and presumably were mainly larger units. Included in this universe are a relatively small number of plants (about 300) who handle more than 3,000 cases per week, a somewhat larger number (about 1,400) who handle 400-3,000 cases per week. The balance—about 2,700—handle varying amounts, but average only about 120 cases per week, which equates to the output of 9 to 10 thousand hens.

Another indication of declining numbers of egg packing plants is the trend in plants covered in the Commercial Egg Movement Report (USDA Market News) despite some definitional changes. In 1963, 689 plants reported, compared with about 280 in 1977. Volume included was only slightly larger in 1975, and was over 40 percent of total production in both cases, thus indicating volume per plant had more than doubled in a decade. The 20 largest firms owning egg packing plants in 1975 owned 45 plants and handled 22.5 percent of total volume packed in the U.S.

The market for cartoned eggs is regional; and while most eggs do not move more than 200 miles, short term imbalances in regional markets may result in very long moves of classified nest-run or graded loose-packed eggs.

Surveys of egg packing plants by Rogers, et al., (39) in four regions of the U.S. indicate that the pattern of combination with other functions varies by region (Table 3). These data indicate that some firms owning packing plants own or contract for production in all regions. The tabulated data overstate the multi-stage involvement because the involvement may not include all eggs handled in each stage.

It is clear that the drift from simple marketing agreements between producer and processor toward resource-providing contracts or common ownership has served to reduce independent producer access to the egg market and to hasten the demise of an open market for eggs at the smaller producer level.

The wholesale distributor function is to a large extent performed by the egg packer. In a number of cases separate firms may act as brokers (performing part of the distribution function) or as wholesalers serving primarily institutions and small store accounts.

Sales to retailers are generally on the basis of continuing agreements to supply store needs either delivered to the store or to a chain store warehouse (where the retailer performs part of the distribution function). These agreements are re-negotiated infrequently. Local markets are characterized by a relatively few price competitive sellers of cartoned eggs facing a few retail buyers.

Egg Products Manufacture. The egg products manufacture (breaker) stage uses about 12 percent of all market eggs. The number of breakers has been declining rapidly. In 1970, about 80 percent of total U.S. production of egg products was produced in 100 plants. The coming of continuous Federal inspection of all egg products, effective July 1, 1971, resulted in about 750 small egg breaking plants ceasing operations (18). Just over 150 breaking plants were either already under Federal inspection prior to that time or were able to qualify for inspection. The number of plants continued to decline to 139 in 1975.

Numbers of plants producing dried eggs under Federal inspection rose during the 1960’s, but since that time have fluctuated between 25 and 30. There were 26 listed in 1976, with 18 of these in the Midwest, 5 in the South, 2 in the West, and 1 in the Northeast.

The 20 largest firms control 43 breaking plants and account for 58.3 percent of total eggs used for breaking. The 20 largest driers, however, represent virtually 100 percent of dried product output.

The market for liquid eggs—other than their use at the point of breaking—is generally limited to 200 miles or less. Liquid eggs are usually manufactured into finished products in a matter of a few days.

Frozen eggs are typically stored at or near breaking plants for several to many months. Many movements to the point of manufacture into finished products are short, but many movements by rail (or truck)
of up to 1,000 miles may occur. Usually, frozen eggs are used rapidly at destination, but can be restored for longer periods.

The market for dried eggs is nationwide in scope. Movement over large distances and storage for a year or more are possible for dried product. End products made from liquid, frozen or dried eggs are likely to move further than the original egg products.

The egg breaking function is typically operated as an independent stage. Small breaking plants, producing liquid and frozen products, are, in some cases, integrated with large egg packing operations. The very large breaking firms may also own or contract for a portion of their egg supply. The combinations of functions performed by firms with egg breaking plants are shown in Table 4 (39). The degree of integration is much less than the raw data indicate since the volume involved in functions other than breaking may be relatively small.

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<th>West Coast 1973-75</th>
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<td>6</td>
<td>5</td>
<td>11</td>
</tr>
<tr>
<td>Contract production</td>
<td>2</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Replacement rearing</td>
<td>2</td>
<td>1</td>
<td>3</td>
</tr>
</tbody>
</table>

* Includes Mountain region.
** Some may have breeding flocks.

FOUL PROCESSING. Fowl is processed by a relatively few firms in specialized plants as well as by some plants which may also slaughter turkeys or broilers. Five firms (including the leading soup company) slaughter an estimated 85 percent of the fowl marketed in the U.S. In each case these are multiple plant operations. A fringe of small firms and multiple product operations account for the remainder.

The market for spent hens is limited to a range of 200 or 300 miles from a plant and typically does not provide the seller more than two or three buyers. The market for chicken meat is regional or national in scope.

IMPACT ON MARKETS. The pattern of change at all levels of the egg subsector has been reduction in number of plants, increased integration and contracting. Although data are not available, it seems that ownership continues to increase while contracting may be stabilized or decreasing.

At the present level of integration inter-stage transfers have been largely but not entirely internalized. Less and less information is public at each stage but the mixed pattern of stage combinations into firms leaves some open transactions at a number of points. Access to markets at various stages of the egg subsector is certainly more open than is the case in the broiler and turkey subsectors. A factor in the difference may be that there remains a variety of apparently equally effective systems of egg production and marketing. No system or size has achieved dominance.

Since integrated systems typically encompass egg packing operations, such firms buy only marginal amounts of eggs in open markets. A visible effect of the extent of this influence is the "drying up" of graded farm egg markets in many areas. But there has also been a modest growth in trading of "nest-run" eggs between plants. Graded egg prices are, however, much in evidence, either at the wholesale or retailer level. It is at these points that both vertically-integrated and free market output is sold except where retailing has become involved in vertically-integrated systems.

Open markets remain for both eggs for breaking and egg products. Negotiated trades are the rule rather than the exception at these levels; but to the extent that the breaker function is integrated with production, packing or food products manufacture, the transfers are internalized.

There has been little change in the products of the egg subsector and their relationship to each other. The primary product remains eggs in the shell form. There has been a shift in the proportion of eggs used in processed form reflecting the consumers move toward prepared and convenience foods in place of home preparation.

Quality of shell eggs reaching the final consumer has improved greatly in the past 30 years. Larger production units, a shortened marketing channel and improved transportation leave little excuse for a stale product in the marketplace.

The picture of the vertical structure of the egg subsector is incomplete. The data are fragmentary and based upon research that has tended to assemble data on a single dimension without the means to build the complete picture. This exercise points up the need for a more comprehensive survey of the extent of horizontal and vertical combinations in the subsector.

FACTORS AFFECTING THE STRUCTURE OF THE SUBSECTOR

PRODUCT CHARACTERISTICS. The nature of the products of a subsector is an important determinant of its organization. The perishability of eggs and egg products is very important to the organization and coordination of the egg subsector. The sequence of perishability for eggs and egg products from highest to lowest is as follows: liquid eggs, shell eggs, frozen eggs and dried eggs. Within the shell egg category, the term "fresh" has diverse meanings. To some, it means bought from the farmer, to others locally-produced, as defined by numerous state egg laws. In other instances, it may mean age. But in official grade standards, it means interior characteristics such as air cell size, visibility of the yolk, or yolk height and albumen density. Ultimately, freshness is related to edibility. Control of movement of inedible eggs, with even a widening of the kinds covered compared to a decade ago, was one of the prime purposes of the Egg Inspection Act of 1971. An additional dimension inspired by consumerism in recent years is the use of "sell before" dates printed on the cartons. This gain in product quality assurance for the consumer serves to accent problems of coordination in the time dimension.

With much less seasonal change in production, seasonal storage of shell eggs is no longer a factor, and with vast improvements in production and handling methods over the last several decades, few graded eggs drop below the Grade A category before sale to consumers and users. A few eggs may now be stored (usually ungraded) up to a month for purposes of meeting seasonal peak demands or to work off temporary surpluses without greatly increased loss. But most eggs move from farm to user within a few to 10 days. Quality changes are small. For example, a difference of only 5 percent in the minimum percentage of Grade A's is allowable between origin and destination gradings.

Eggs in commercial channels are graded and sold according to U.S. standards for size and quality, or their equivalents in state or commercial standards. Some nest-run or wholesale level grades—official and unofficial—exist for trading purposes, but ultimate sales are usually
according to consumer grade standards. While nearly all eggs are graded using USDA standards, less than 30 percent of the eggs reaching consumers are graded under USDA supervision and carry the USDA grade label.

Product differentiation for eggs is largely a matter of the brand on the container. This may not be particularly important for bulk egg products or shell eggs sold loose in cases, but most cartoned shell eggs carry either the retailer's or the supplier's label. Probably about half the shell eggs sold at retail carry packer brands, with the balance retailer brands. There has been growth in the proportion under packer brands since the 1960's, somewhat in parallel with the rise in importance of integrated production and marketing organizations.

Frozen or dried egg products sold to retail bakers and the institutional trade often carry the processor's brand. Large volume users of egg products are more likely to buy on a specified quality basis from the manufacturer.

The product of the breeder represents another story. There one finds high barriers to entry, differentiation, brand names, advertising and other forms of nonprice competition. When the number of hatcheries and producers was larger there was considerable brand loyalty and imperfect knowledge on the part of the producer. Breeders did attempt to maintain control of the product through requiring hatcheries to handle only one breed and by assigning exclusive territories to the franchisee. These practices were stopped with an FTC action against Kimber in 1962. The Kimber case resulted in a consent decree which barred exclusive dealing and exclusive territories and the case has served to modify the conduct of other breeders as well.

The breeder's product is judged on the basis of the production performance of his bird. The popularity of a strain has been seen to shift rapidly in response to a change in performance verified by the National Poultry Improvement Plan Random Sample Tests. It is a differentiated product although the major performance attribute is net return per pullet housed.

The National Poultry Improvement Plan is a Federal-State program which provides for voluntary participation of hatcheries and breeders to establish standards for the evaluation of breeding stock and commercial chicks on the basis of performance and freedom from disease. NPIP became operative July 1, 1935 and for many years served to enhance competition and fair trade among breeders and hatcherymen. The Random Sample Performance Tests provided a public evaluation of the product of the breeder and hatchery. The results of these tests run by the states are published annually by the USDA.

The National Plan is far less important today when a major share of sales are to hatcheries or producers who are expert buyers and capable of their own performance evaluation. Many customers may know more about the performance of breeds under specific conditions than does the breeder. Clearly brand loyalty on the part of these large customers is likely to be weak or absent. The smaller producer is likely to behave in a more traditional manner and to be more responsive to non-price means to influence buyer behavior. The increase in proportion of sales to the large "expert" buyer has produced a situation in which the share of market may shift very quickly in response to changes in breed performance. The decisions which mean profits or losses to the breeder are made by the commercial egg producer, but the breeder's direct customer is the hatchery which may or may not be integrated with production.

Breeders and hatcheries have been forced to adapt to the emergence of the large integrated producer. The integrator, who may own the hatchery as well, is not likely to operate with a single strain of layer. The large producer normally operates with more than one strain of bird to spread risk and to avoid missing a significant improvement. Even without the Kimber-FTC decree, the breeder was destined to lose some control over the use and distribution of his product.

ENTRY AND EXIT CONDITIONS. Entry and exit conditions from the egg subsector are determined by technological, marketing and structure considerations. Entry at any stage of the system requires the adoption of modern technology and much larger initial investment than was the case in the past. The proportion of fixed to total per unit costs has also increased. In many cases some arrangements with other firms are needed for entry, particularly in areas of low production density.

The production stage is the easiest to enter with investment requirement within the means of a sole proprietor and marketing arrangements and production contracts available in most areas where eggs are already produced. Pullet growing is nearly as easy to enter although contract arrangements would most likely be involved.

Entry into assembly, packing and distribution is more difficult because of the long standing arrangement between retailers and existing packers. Entry as a specialized packer is more difficult than the addition of packing to a production unit because of the size of market need to support the stand alone packing operation.

The hatchery stage is at least as difficult to enter except as a move into hatching on the part of a large integrating producer. Sufficient sales in a limited geographic area would be difficult to achieve.

Breeding would be the most difficult to enter with product differentiation, very high initial costs and a total market which is small relative to efficient firm size.
Aside from the more limited opportunities for noncommercial and small direct marketing producers because of the shrinking share of the total market available to them, entry conditions for small egg producers may be less stringent than for larger units. At the same time, they must be able to secure higher prices to cover higher production and marketing costs. As a consequence, exits from these groups have greatly exceeded entrances over the last two decades. Small residual farm flocks have declined steadily—with few if any new entrants—and can be expected to decline further because of their incompatibility with the volume and quality requirements of the commercial system.

TECHNOLOGY CHARACTERISTICS. Because of material improvements in breeding, feeding, and management, average egg production per layer on hand has now reached almost 240 eggs per year, up more than 20 percent over the last decade. The number of pounds of feed per dozen eggs has declined almost 15 percent. Laying flock mortality has also declined slightly, particularly since the development of Marek's Disease vaccine in the late 1960's.

With $5-6 investment in house and equipment per bird, $100-120,000 would be needed for a 20,000 bird unit requiring 1.0 to 1.5 man-years of owner plus hired labor. About half as much labor is required per bird as a decade ago, with a substantial increase in mechanization accounting for the change.

In both egg packing and egg breaking the shift toward larger average sizes of plants has meant a substitution of equipment (and investment or rent) for labor. But, there has also been an intensification of mechanization over a wide range of plant sizes as new types of equipment have appeared. A comparison of various older (36, 17, 13, 26) and more recent studies (4, 6, 33) suggests that the number of cases handled per employee per hour in egg packing plants may now run 60 percent higher than a decade or so ago. Capital investment per plant has almost doubled, 50 percent of this being caused by inflated costs and the remainder to intensified mechanization. For example, investment in buildings and equipment for an egg packing plant of about 250 cases per hour capacity would be about $500 thousand currently compared with less than half that in the mid 1960's. Similarly, in egg breaking plants, output per hour of labor has risen about 50 percent mainly because of the widespread shift toward machine breaking (43, 13). Building and equipment investment in a plant of 5 million pounds per year capacity is now about $315,000, 70 percent over that of a decade earlier.

CHANGES IN INDUSTRY CAPACITY AND IN CAPACITY UTILIZATION. In the absence of periodic surveys, it is not possible to determine what usable capacity is for most functions. Indirect approaches are not a totally satisfactory substitute.

Since there remains some seasonal variation in egg production as well as in replacement rearing and egg breaking (though there are also irregular year-to-year effects), use of capacity within the year varies. For example, ratios of average to peak numbers of layers show average numbers as about 96 to 97 percent of peak numbers. And the average number of egg type chicks hatched per month is 70 to 80 percent of the peak month.

Use of capacity to produce eggs can be measured several ways, any one of which could be altered by the density of layers per cage or per square foot of floor space. For example, consideration of mortality plus culling during a laying cycle might suggest 80 to 90 percent use of capacity in current use. If recognition is given to the growing proportion of egg production in cages (close to 85 percent now for market eggs) and the existence of some unused, but retrievable (technically but not necessarily economically) floor capacity, current use of potential capacity might run close to 80 percent. This annual ratio might not be very different than a decade or two ago. Such ratios, of course, obscure the performance being achieved now vs. a decade ago.

Use of hatchery capacity rose from 27 percent in 1955 to 47 percent in 1965 and to over 65 percent in 1975 based on January 1 egg capacity and chicks hatched in the matching fiscal year. This includes both egg-type and broiler chicks. An earlier study (36) estimated that feed mills servicing egg laying enterprises operated at 80.7 percent of capacity in 1964-66, based on 305 8-hour production days. The rate of utilization is believed to be similar or somewhat higher today.

Average week vs. peak week volumes handled by plants reporting to USDA for the Commercial Egg Movements Report and by egg breaking plants under Federal inspection suggest 92 to 94 percent use of egg breaking capacity. Average month vs. peak month indicates around 80 percent use of egg breaking capacity. These types of measurements do not allow for full use of double shifts. Also, breaking is much more seasonal than shell egg movement which accounts for much of the above difference.

CHARACTERISTICS OF COST FUNCTIONS. Most of the economies of scale studies applicable to the poultry and egg industries were carried out during the period from the late 1950's to the mid 1960's. With each functional study, there was the expectation of a decline in unit numbers and an increase in average size. But, the subsequent process of adding vertical stages (input-supplying, production, assembly, processing, etc.) developed some spatial limitations to the possibilities of achieving economies of scale in performing on-site functions. Vertical integration
and other coordinating devices also made it possible to increase the density (or reduce the size) of supply or distributing areas.

While various scale studies are not in full agreement, and are often changed by considering multiple-shift plant operations, or may not be exactly validated by actual cost studies, some measures of the degree of realization of economies of scale can be established. The concept “most of the economies of scale” which is used below means a size sufficient to attain about 80 percent of the cost reduction possible. This recognizes the shape of the typical scale curve which declines sharply at first and tends to flatten rapidly.

If one uses 20,000 birds per man (plus some hired labor periodically) as a standard, two-thirds of the hens are in flocks of 20,000 and up and able to realize most of the economies of scale in production. For egg packing, perhaps one-half to three-fourths of the eggs move through plants large enough to achieve most of the economies of scale. For egg breaking, perhaps three-fourths of the volume is processed by plants large enough to achieve most of the economies of scale. The proportions of volume are impressive, but only small percentages of the farms or plants are included. Thus, considerable incentive for fewer units remains unless apparent scale economies are modified by location factors or the smaller units are in reality supplying a different product-service combination.

The analysis is complicated by the emergence of the production and processing complex where a large production unit (240,000 or more layers) is connected directly to a processing unit. Eggs are moved by conveyor belt directly from layer cages to egg processing at much lower cost than assembly from multiple production locations. These units represent a compromise combination of a smaller than minimum cost packing plant with a larger than minimum cost production unit. The cost savings from direct transfer of eggs from layer to packing more than offsets higher than minimum packing costs. A recent study (11) indicated that, assuming equal production performance, the centralized complex could produce at lower cost than a decentralized family-producer system even if no charge is made for producer labor in the decentralized system. The premise of equal production performance is debatable since the large complex presents a greater disease risk, and some believe that the quality of husbandry is lower than in family sized units.

The average hatchery today is easily large enough to achieve most of the economies of scale. It is also adequate to serve several large (but not the largest) integrated production organizations. In an earlier study (36) sampled feed mills produced about 100 tons a day. Most of the economies of scale would not be achieved until capacity is 200 tons per day.

Scale economies are clearly a factor in the organization of the egg subsector. The size necessary to achieve most of the economies in the capital intensive breeder stage involves a unit much larger than even the largest production firm as a result, there has been little integration from or into breeding. Near minimum cost for hatching egg production occurs at a smaller volume than for hatcheries; but coordination and control needs overshadow the difference and encourage integration of these stages.

The size of pullet growing unit needed to obtain most of economies of scale is larger than most single house production units but lower than the size of the type of production-processing complex described above. The minimum cost pullet volume is only a fraction of the typical hatchery capacity.

The size of feed mill needed to achieve most of the plant scale economies is quite large for any production unit. But, a smaller feed plant run to capacity in an integrated unit producing a small number of feeds is often in a favorable cost position relative to the larger non-integrated mill.

One cannot expect all units in a subsector to operate at or near minimum cost size. The spatial dimension of markets combined with relatively large size needed to reach minimum costs means that the minimum cost size and location of processing or input supplying plants would leave only one buyer or seller for each area. Therefore, one is faced with either smaller than minimum cost plants or some degree of local monopoly. The existence of this dilemma may be a factor favoring integration.

Economies of scale in production-type operations (on-farm production, packing, breaking, feed milling, hatching), and their associated spatial costs are, however, only one aspect of scale. The other dimensions of scale—management and coordination, marketing, financing, or risk-bearing—may prove to be far more important than technically efficient units. Perhaps the most important of these may be the ability of larger units to deal more effectively in the imperfect local markets for inputs and for eggs. Imperfect local markets for products and labor may also provide the niches in which many small units remain.

FINANCING AND CREDIT CHARACTERISTICS. In recent decades, the egg industry has evolved from one using traditional and localized sources of financing and commodity credit to one where widespread use is being made of additional sources. Independent egg producers made extensive use of local bank and Federal agency mortgage loans, Production Credit, feed dealer, hatchery and other business firm credit, and drew where possible on accumulated personal-business savings. Plant financing drew upon cooperative and local businesses, and the
lags in payments to producers of one to several weeks were, in turn, a reflection of distributor settlement practices. The advent of contract production not only became an additional source of financing large segments of producers' variable costs, but also often involved package deals or co-signing with banks by integrators on investment items. In turn, growing ties between integrators and marketing firms often brought plant financing. The cash method of income tax reporting also provided independent producers or integrators with a way of short-run underwriting of growth.

The cash method of accounting and prepayment of expenses made egg production operations an attractive tax shelter. But the tax shelters tended to be organized on a large scale by promoters rather than traditional farmers. Use of supplier credit by producers also led to contracts or ownership integration. The risk assumed to extend credit for feed and pullets in a volatile business was so large that a desire for more complete control through contract or ownership was a natural consequence.

Particularly in the last decade, large private or corporate integrated firms have entered new capital markets. These include regional or national banks, small business loans, state development funds, issuance of stock, and publicly-offered investment plans. The stocks of more than a dozen large firms with interests in the egg industry are now quoted on major exchanges. Moreover, the acquisitions of egg firms by other food firms and conglomerates have opened large-scale capital sources. To some extent, the success of large firms in achieving low costs has produced profits for internal capital generation, though such profits have been cyclical.

Types of Firms Involved at Each Stage. The various directions in which the egg subsector has developed simultaneously, and the intrusion of interests from other agricultural and nonagricultural groups, makes it difficult to generalize or describe typical firms. Perhaps two-thirds of the egg volume (excluding input-supplying) is still associated with firms which are entirely or primarily egg-business oriented. The picture varies by stage.

Egg production and replacement rearing may be combined on the same farm on small to medium-size farms. Large integrated firms are likely to produce replacements on a separate farm from the egg producing units, though some may contract with separate pullet growing firms. The same alternatives also exist for integrators using contract egg-producing flocks. With a savings of 20 cents per pullet through growing their own vs. buying from other firms, and more certain control of delivery dates, many producers select this alternative.

Feed and hatchery activities are often associated with egg produc-

tion in large firms. In some areas group buying of feed is used to advantage instead of integration or contracting. Likewise the availability of cooperatives as suppliers of feed or chicks may discourage integration of these activities.

The degree of vertical combinations which include production is extensive. Not only ownership or contract production but also management arrangements, unwritten contracts and agreements, and service deals are involved. It is, therefore, not unusual to describe an integrated firm as having so many birds on its own farms, plus so many on contract, and managing or marketing the output of so many others. Such a firm—where it does not own them—may also have arrangements to obtain feed or chicks (or pullets) from particular suppliers, or to send its eggs through particular packing plants or distributors.

The type of firms at each stage of the egg subsector cannot be characterized easily. There are small sole proprietorships, single stage firms, cooperatives, specialized corporations and large conglomerates involved at each stage. There is no clear indication that a single type of firm will dominate any stage. Highly variable earnings from production have discouraged some publicly-held firms. The largest egg business firm, Cal-Maine Foods is public, but, it has shifted much of the production risk to limited partnerships for which Cal-Maine provides management and marketing services.

Merger and Acquisitions. Growth of firms in the egg subsector has been primarily internal although mergers and acquisitions have been significant. As indicated earlier, three major breeders have been acquired by large firms whose primary business is not eggs and one major breeder has been absorbed by another.

Hatcheries have not been the focal point of activity in recent years as they had been in the early post-war period. The reduction in numbers of hatcheries has been more the result of exiting firms than of mergers or acquisitions.

The largest egg production and marketing firm in the U.S., Cal-Maine Foods, was formed as the merger of three already large integrated firms. One of the three original firms has since separated from the merged company. The more common consolidation path is for the assets of a financially weak firm to be acquired by another producing firm in an extended period of low egg prices. In other cases, on-going large family companies have been acquired by other types of firms.

Excluding the Cal-Maine merger and the consolidation of breeders, mergers have not been a particularly important factor in the growth of firms or the span of control of firms in the egg subsector. The reduction of tax advantage for ordinary corporations over one million dollars
in sales or a reduction in the variation of egg prices could well alter the subsector sufficiently to bring about more growth by merger.

COORDINATION WITHIN THE EGG SUBSECTOR

The egg subsector has operated without government price support or control of output. In some cases state regulations, instituted in the name of consumer protection, may impinge to some extent upon the coordination process. In a broad sense the subsector is market coordinated. As one would expect, as the time frame of examination is shortened, coordination becomes more concentrated and less price dependent.

COMPLEXITY OF THE TASK

The coordination task is simple in the sense that the spatial (geographic) and temporal (time) dimensions of the marketing channel are short and product changes are not large. The task is made more complex because the product is perishable, the demand for eggs is relatively unresponsive to price and by the seasonality of both production and demand.

Short marketing channels are due in large part to the fact that egg quality declines with time and to some extent in relation to distance moved or with additional handling. As indicated earlier, eggs may remain under the control of one firm from production through sale to a retailer. Even the least integrated of the existing vertical structures represents a relatively simple system.

Several factors outside the control of firms in the system may have a substantial impact on the coordination task. Change in consumer demand is probably the most important of these. Feed cost changes have become more important in recent years. Weather and disease do have a considerable impact on output from time to time. Development of an effective control for Marek's Disease (a cause of extensive loss) in 1971 brought severe adjustment problems with production capacity suddenly increased substantially in little more than one year.

The major sources of coordination problems within the sector are common to most market coordinated agricultural commodity systems. Producers tend to respond to current prices when making future production commitments; there is a lag of about 18 months from a decision to change output and its full realization. A more or less cyclical pattern of prices and production is the result. Limited potential for storage and a very inelastic product demand increase the severity of the problem.

There is a tendency for retailers to base prices on the previous week's wholesale price rather than to reflect these price changes immediately. This lag tends to impede coordination in the very short run. It fails to provide the proper signals to consumers and they do not adjust their consumption to clear the market.

Decision points in subsector can be classified by length of run and level in the system. The time dimension (length of run) is divided into long-run, short-run and market period. The long run is viewed as a period sufficiently long that all factors are variable, the short-run as a period in which the decisions are limited to intensity of use of existing assets, and the market period represents a period so short that production potential is predetermined. A rough matrix of decision points so classified is shown in Table 5.

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<th>Table 5. Egg subsector decision matrix</th>
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<td><strong>Level</strong></td>
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IMPORTANCE OF COORDINATION

Eggs are produced and consumed every day. The product is perishable. Although eggs remain edible and nutritionally sound for 6 months or more when stored under appropriate conditions, they are normally classified as storage eggs after about 1 month. Such eggs are no longer
considered an acceptable product at retail. Both production and consumption are seasonal and this adds to the complexity and importance of the coordination task. Without effective coordination, price instability would be unbearable. Coordination can result in reasonable levels of inventory in the various size groups and an allocation among uses (shell egg vs. breaker egg market) which approaches an optimum.

To facilitate coordination among uses, a system of grading according to size and quality has been in place for years. USDA standards and USDA inspectors are used by most large processors on a fee basis to provide third party grade evaluation. Some states impose standards above the USDA standards which causes some slight imperfections in pricing and allocation. But in general these differences in standards have been unimportant deterrents to coordination. Especially the system keeps grocery store shelves stocked and provides consumers with a readily available supply of eggs at all times.

COORDINATING MECHANISMS

By and large, individual negotiation between and among firms is the principal way in which the production and processing system is coordinated. The quantity, quality, and timing dimensions of transactions between firms are negotiated at all levels in the vertical channels of trade. The charges for services from assembly through packing, transportation, wholesaling, and delivery to the retailer are mostly individually negotiated. At the wholesale level (that is, transactions between assembler-packer units and the wholesalers and retailers) these charges are negotiated in relation to publicly reported base prices (which vary over time) for eggs of different sizes and qualities. The formula components that relate the transaction price to the base price are negotiated and reflect differences in the type, kind, and qualities of services provided.

Short and long inventory imbalances of merchants are corrected primarily by trades among marketing firms but also through price and merchandising adjustments. Each firm or set of firms has its own individual formulas. The values of the formula are more or less competitively determined. The institutional arrangements which facilitate coordination and the determination of value are discussed below.

PRICE REPORTS. Urner Barry Publications has published price quotations for eggs for over 100 years. For many years, this quote reflected the value of eggs at wholesale in New York City. During more recent years, the table egg quote has been defined as reflecting cartoned eggs delivered to chain store warehouses in the New York area. The publication includes a constellation of prices for several sizes, grades, and levels in the channel of trade. Over the years, it has become a common practice in the trade for firms to agree on the use of the Urner Barry wholesale quotation for table grade eggs as the basic value around which transactions are negotiated. The most important of these quotations is the one for large white eggs. The staff of Urner Barry Publications survey the industry to determine the going prices, the inventory situation, the relative strength of demand, and the availability of eggs throughout the market. Based on changes in many factors that they feel important in the determination of value, the quotation is adjusted up or down. The movements up or down are designed essentially to clear the market.

In general, the quotations of the Urner Barry Publications have been viewed by the industry as third party, objective indicators of value. The quote has been faulted because it does not represent open market trading at a specific level in the subsector; that is, it is not a compilation of actual market prices. One can state that they are market quotations that attempt to reflect the current market situation. The quotations are to some extent self correcting in that if they are wrong, counter-adjustments occur in inventories, etc., which give a signal that the quotation must be changed.

Although the Urner Barry quotation is the one most widely used throughout the industry, others are used as a base for transactions. They are the USDA Market News Service estimate (report) of selling prices (firms usually use the reported price for the market nearest their location of business); and the quotations of the Egg Market Evaluation Committee. Some firms, especially those that are completely integrated from production through to the consumer, or close to the consumer, do not price in any fixed relationship to Urner Barry Publications or any other base quotation. Rather they use these prices as a guide and vary their prices only to the extent they think it necessary to achieve marketing and profit objectives.

EGG CLEARINGHOUSE, INC. Egg Clearinghouse, Inc. (ECI) is a national exchange for the trading of eggs and egg products which is located in Durham, New Hampshire. The exchange was organized on a nonprofit basis largely because of producer interest in initiating a system of pricing based on open public exchange.

ECI began operation in essentially its present form in 1972 as a manually operated exchange for truck lots of gradeable nest run eggs. Ungraded eggs are classed by weight with a minimum quality standard (checked by sample). This innovation in trading level has been a key factor in the increasing use of ECI. Trading graded eggs (thought neces-

sary to assure quality) represents an economic waste since in most instances the eggs had to be regraded prior to cartoning. Regrading adds cost and accelerates quality loss.

Members of ECI (284 in late 1977) may trade their own account or act as brokers for others. At this writing trade matching is by computer. Bids and offers are accepted by telephone and entered into the computer by ECI personnel. Trading volume reached 999,000 cases during 1977 (about .5 percent of total production).

ECI represents a means to centralize the trade negotiation process while the product moves directly from seller to buyer by least cost means. The institution of nest run egg trading and centralization of the clearing process are contributions to physical efficiency of the egg marketing system as well as an improvement in the price discovery process.

Public trading alone does not provide a clear indication of values because trades are at various locations and the level may vary during a trading session. The Egg Market Evaluation Committee was established to translate ECI trading and other information into single valued price quotes for the several classes of eggs twice weekly. The committee consists of 8 persons with no financial interest in the egg business but who know and understand the industry. The committee meets by telephone conference call prior to each quote release. Both an ECI trading summary and the EMEC quote are published widely, including in the USDA's Market News.

At one time the Urner Barry quotation as well as the USDA Market News price reports were based to a large extent on open trading on the cash egg markets conducted by the Chicago and New York Mercantile Exchanges. These cash markets involved trading small lots of graded eggs packed loose in cases. Both the location and product form traded became obsolete and no longer represented, in any sense, the main stream of egg marketing. The cash markets were used little and when used it was mainly for the purpose of influencing price rather than as a part of the marketing process. Cash trading was discontinued on both the exchanges on March 16, 1970.

**THE FUTURES MARKET.** Egg futures are traded on the Chicago Mercantile Exchange. Egg futures developed as a storage egg contract when storage from the heavy spring production period into fall and winter was common. The market served as a hedging medium for the holder of storage egg inventory. The old contract became obsolete as the seasonal pattern of production became less pronounced.

The egg contract was changed in several stages and now specifies a relatively high quality fresh egg deliverable in the packer's plant with freight adjusted to Chicago. These changes were expected to make the contract useful to the modern producer for hedging. Trading volume increased to 688,000 contracts in 1970 but has decreased to 146,000 during 1976. An unusually large number of contracts are settled by delivery. Graded large eggs are deliverable, and, as noted in the discussion of ECI, this process is less than efficient. Generally the delivered product is worth less to the receiver than it cost to make the delivery, and the delivered graded product often sells even with or at a discount to nest-run eggs in the same weight class. An attempt to initiate trading in nest-run futures failed although many believe that nest-run egg trading is the more desirable alternative.

Fresh egg futures have not been used extensively for production hedging. As noted earlier the production cycle is 18 months long or longer whereas most egg futures contracts are traded only 8 to 10 months before maturity. Such a time period does not provide much guidance at the time of starting a flock but it gives some guidance for short-term flock management decisions such as forced molting. A variable relationship between base trading values, such as the Urner Barry quote, and futures prices in the contract month further limits the use of egg futures for hedging.

Some observers believe that the tendency to use futures to speculate rather than to hedge has prevented the institution from realizing its full potential to reduce instability generated by the production stage of the subsector. Producers often call futures a hedge whether initiated to reduce risk or to speculate. Futures (eggs, corn and soybean meal) can be used to reduce price uncertainty, to stabilize producer returns to some extent, to guide expansion planning, and to manage credit. Research has indicated a potential for gains to producers from the use of hedging (20, 25).

**GOVERNMENT PURCHASES.** Government has purchased egg products for various programs such as school lunch and food distribution to the needy. Purchases were varied in an attempt to stabilize price until recent years when purchases have been to supply program needs rather than to aid the egg producer. Purchases totaled 1.3 percent of production during 1961, the peak year. Given the very inelastic demand for eggs, these purchases no doubt had some impact on prices. Purchases were in the form of dried eggs or mixes including dried eggs. In at least some cases products were specified to be made from table grade eggs to maximize market impact. The purchases probably had a very minor impact on coordination of the subsector.

**EGG RESEARCH AND PROMOTION ORDER.** An Egg Research and Promotion Order under the authority of the Egg Research and Promotion Act (signed into law October 1, 1974) was approved in a producer refer-
endum in late 1975. The order provides for advertising, sales promotion, and consumer education with respect to the use of eggs, egg products or spent fowl, as well as research, market development and creation of new products. The order is administered by a board composed of producers and is financed by collections from producers of market eggs (owner of the hens) with more than 3,000 hens. The initial board was appointed and organized in 1976, with fund collection begun in late 1976 and the first programs initiated in early 1977. The present assessment of 5 cents per case is expected to raise 5 to 7 million dollars per year. Producers may request a refund of the assessment.

The funds are being used in an attempt to shift the demand for eggs so that more eggs can be sold or consumed at the same price. The program, appropriately managed, could improve coordination; however, such a result would be extremely difficult to achieve. Since the decisions will be made by producers, they are likely to be made more from the viewpoint of producers than from a market view. A promotion program geared to offset temporary imbalances is not likely to occur, although it is possible that a program can be designed to stabilize sales. However, as in many order situations, a by-product of the activity will likely be the collection and distribution of additional information which may improve coordination.

During 1977 the order funds were used for national television advertising, preparation of selling aids, cooperative programs with state agencies and to sponsor research. Research efforts included the study of the effect of egg consumption on human health, the search for new uses for eggs and the design of merchandising programs.

STATE MARKETING ORDERS. There are many states in the United States that have a state egg marketing order. Most of these are designed to raise funds for the purposes of promotion. However, California did experiment at one time with an order which included a supply management provision. Essentially it was designed to establish a set aside pool, whereby, when eggs were deemed to be in surplus (that is when price was lower than the industry would like to have it) a set aside program would be set in motion. Individual producers would be told to hold off the market some portion of their total supply. This program lasted for only a short period of time before it was attacked by consumer interests and withdrawn. It is questionable whether the imposition of the order improved coordination or tended to create more confusion. The process itself interrupted the market clearing process, and this interruption distorted price signals to producers and consumers and delayed adjustment of the quantities of eggs produced and the volume of eggs consumed as shell eggs.

OTHER INFORMATION SYSTEMS. The egg subsector is served by a number of public organizations which provide information useful to the coordination process. The U.S. Department of Agriculture is the major source of data and provides a significant amount of analysis which contributes to the coordination of the subsector. Agricultural Marketing Service Market News collects and disseminates current information on market conditions, inventories, commercial movements and prices. Information is disseminated on a twice weekly basis for several cities in the U.S. Economics, Statistics and Cooperatives Service (ESCS) collects and distributes information on breeder placements, hatchery production, layer numbers, egg production, egg products manufacture, and fowl slaughter as well as data on farm prices and income. These data are released monthly in most cases. ESCS provides analysis, and outlook information; most short-term analyses are published as a part of the Poultry and Egg Situation reports.

The important role of the Utter Barry price quotation has already been outlined. Another private company, Commodity News Service, provides a wire service, Poultry and Egg News, which carries all relevant government reports, ECI trading and prices and other news of interest to the egg subsector. The several producer and trade association groups also provide information and analysis for their members.

COLLECTIVE ACTION ORGANIZATIONS. Collective action organizations in the egg subsector can be classified into three major groups: operating cooperatives, service cooperatives and trade associations. There are no bargaining cooperatives of consequence.

There are a large number of local or regional marketing cooperatives who perform the assembly-packing-distribution function for members or who perform the sales and distribution function for eggs packed by integrated producer-packers. These operations range in size from Agway (in the Northeast) and Nulaid (California) to small single plant cooperatives found throughout the country. A number of the larger cooperatives also provide feed and chicks. The relationship of cooperatives to their producer members cover the full range of marketing agreements and contracts similar to those used by other types of firms.

A new cooperative, Eggmar, provides marketing services to members, all of whom have a packing capability. The cooperative operates as a sales agent for members for all or part of their output on a contract basis. Its expressed objective—to stabilize the relationship between prices to retailers in major markets and the base price quotations—takes this organization close to the bargaining mode.

United Egg Producers and its member regional cooperatives (National Egg Co. (southeast), Northeast Egg Marketing Association, Midwest Egg Producers, Western Egg Co., Northwest Egg Producers Association and Southern California Egg Cooperative) serve a variety of
functions. All are organized as agricultural cooperatives to gain Capper-Volstead protection for a role in the pricing process. Several of the regionals provide clearing services (matching buyers and sellers) for members and negotiate for supplies on behalf of members. Prior to the national promotion check off these cooperatives were active in supporting limited promotion efforts.

At one time United Egg Producers attempted to influence prices through direct buying. That effort nearly bankrupted the organization with no perceivable impact on price. A now defunct cooperative, Southwest Egg Producers, attempted a diversion program to increase returns to Southern California growers but found itself unable to control production on a voluntary basis.

More recent attempts to moderate production increases on a voluntary basis have also failed. United Egg Producers now limits these activities to wide dissemination of analyses and data to its members. These cooperatives also attempt to represent producer interests in legislative matters at the national level.

Trade associations include state poultry organizations in the important production areas and general poultry trade associations. The latter represent all levels of the poultry subsectors and their efforts center on information diffusion, trade shows, educational programs and to some extent representing broad poultry interests in the legislative process.

COORDINATING ELEMENTS. In spite of the important role of contracts and other nonprice coordinating arrangements, the major coordinating element for the egg subsector is price. The price signal influences production, consumption, and storage decisions to clear the market. Formula pricing is used to establish transfer prices throughout the U.S. at almost every level of trade for table eggs. One might say that the whole constellation of prices for the various sizes, grades, and levels are tied by formula and competition to the Urner Barry spot market quotations for table grade eggs discussed earlier. Most transactions between firms located east of the Rocky Mountains are tied directly or indirectly to that quotation by some formula. In many cases it is a very specific formula of so many cents above or below for specific sizes and grades of eggs. In other cases, there may be some flexibility.

An example of the kinds of relationships that exist and the extent to which the industry ties to a particular quotation can best be explained by an objective survey conducted in New York State (9). In that survey, it was found that the 54 New York State producers interviewed (a randomly selected sample) used three different arrangements in determining the basis for transaction prices. The three wholesale price quotations used as a base were: 1) Urner Barry wholesale quotation, 2) USDA Market News (high market), and 3) USDA Market News (low market).

The majority of the producers (39 of the 54) priced relative to the Urner Barry wholesale quotation. Twelve of the producers received prices based on the USDA high market quotation and the remaining three on the USDA low market quotation.

In terms of total sales, 82 percent were priced on the Urner Barry quotation. Retail chains, cooperatives, and corporations dealing with the interviewed producers used the Urner Barry quotation exclusively. USDA Market News quotations increased in importance at the independent store, jobber, and restaurant-diner outlet.

Producers selling nest-run eggs on production contracts or marketing agreements indicated that they had very little control over the price of eggs and that the transaction price on any day or for any week was based in some generally fixed relationship to the published wholesale quotation. However, producers selling cartoned eggs to independent food stores claimed some discretion with respect to price received.

The extent to which actual transaction prices were locked to the base by a fixed formula varied among outlet types. All producers selling to cooperatives, producer-processors, corporations, retail chains, institutions, wholesale distributors, and jobbers used fixed differentials. These differentials were maintained except in the case of extreme and prolonged swings in the wholesale quotations. Producers indicated that a change in the differential was usually initiated by the buyer. Volume sold under this type of arrangement approximated 73 percent of the movement of eggs through the commercial marketing channels for the 54 producers interviewed.

Differentials were responsive to changes in the wholesale quotation for sales to independent stores, restaurants, diners, and direct to consumers. In these cases, differentials were decreased in periods of high prices and stretched during the periods of low price.

Among the outlet types in which differentials were not locked to the base quotation, there appeared to exist a relationship between size of outlet, number of services performed, and the producer's ability to adjust the transaction price. Adjustment of differentials for producer-processors selling to larger independents and restaurant-diners appeared to be non-existent. A more flexible pricing schedule existed for sales to smaller independents and restaurants-diners.

In general, the size of the differential between the base that is used and the actual transaction price for a particular level of trade is determined through competition. Negotiation takes place on the size of the differential as firms compete against each other.

Thus, movements in the Urner Barry quotation result in a movement
up and down of the whole constellation of prices. The quotations published in the Urner Barry publication are for specific sizes—extra large, large, medium, pullet, peewee, off-grade large, and brown large. The relationship between the prices for these various sizes is adjusted depending upon changes in relative supply-demand conditions for each particular size.

The above is somewhat oversimplified. Individual firms do trade eggs among themselves and the prices for most of the spot transactions are individually negotiated. However, they will almost always be negotiated relative to the Urner Barry quotation.

Several agencies try to influence the adjustment process and facilitate coordination. The United Egg Producers has published suggestions as to the appropriate size of the nation’s laying flock to achieve a particular target price. If all producers were to change according to those suggestions, the price would likely be achieved. However, every firm makes its own independent decisions and adjusts its production based on its costs relative to the price that it expects to receive and its ability to market its product.

Over time, the margin or price received for performing the marketing services has remained relatively constant for egg processors, distributors and wholesalers. The principal burden of price movements therefore falls on consumers and producers. The only portion of the subsector that does not respond and adjust prices with the rest of the subsector is the retail portion. Retailers apparently have different motives for pricing specific items in the store. At times the retail price is featured at or near cost. At other times, mark-up is substantial at 25 percent or more above cost to the retailer.

Prices for eggs used in breaking are, of course, related to the level of prices in the table egg market; however, the spread between the two varies. Egg product prices are essentially competitively determined, although egg product processors are likely to have a list of suggested prices for egg products that salesmen use in making contacts. Trades are negotiated between processors and large egg product buyers. Egg processors, then, pay for eggs based on their ability to sell product at different prices, and their ability to obtain an adequate supply. One can argue, then, that the price for eggs for breaking purposes is also competitively determined as major processors bid for the supply which they need.

COORDINATING THE SYSTEM. The bulk of the commercial egg output and inventory decisions are made by firms controlling more than one stage of the system based on current and expected prices. Likewise, consumption decisions are influenced by price. Changes of ownership of commercial eggs at more than one stage occur in substantially all cases with sales to retailers or sales to breakers and in all cases in the transfer to consumers. A number of arrangements exist for formula pricing, but most such arrangements are adjusted (re-negotiated) at irregular intervals. In this way the formulas are kept current by competitors in search of markets or supplies.

Contracts, marketing agreements and other nonmarket transfer arrangements at other levels in the system are kept current, by a similar process of re-negotiation and adjustment. The adjustment of production contract terms in individual cases may be infrequent, particularly in the case of multiple flock contracts. All ownership integration combinations, nearly all resource-providing contracts, and some other arrangements transfer the decision-making task from one or several stages to a single stage. In effect the vertical grouping becomes a single decision unit or single profit center. The coordination of product flow and harmonization of stages are decided within the combined system. The output level decisions then include consideration of all appropriate costs and revenue for the vertical subsystem in the ideal case. If contract terms do not reflect appropriate costs to the decision maker output decisions will be made to maximize the welfare of the decision maker level given the inappropriate contract terms with less than desirable results for the full system.

Coordination of the subsector is, therefore, achieved by a combination of market and nonmarket means. In the end it is price directed. At some stages such as sales to retailers a few months may be needed to adjust all arrangements; at other levels longer time periods may be needed.
BEHAVIOR AND PERFORMANCE IN THE SUBSECTOR

PRICING AND PRICE VARIATION

Pricing and price variation are basic dimensions of the behavior and performance of the egg subsector. Price variation has been a matter of concern to decision makers at all levels of the subsector. As indicated in the previous section, the entire set of egg prices tends to move together reflecting changes in the (or causing changes in) Urner Barry quotation. Comparisons of prices and price spreads is complicated by the changing definition of the base quote itself. This shift in relationships is shown clearly in Table 6. The UB quote has increased relative to the USDA Market News quotes for New York wholesale prices and prices paid to Iowa farmers for grade A large eggs produced under a quality control program.

The analysis of the price variation is focused on two major responses:

1) Changes in production level in response to price and
2) Response of consumers and marketing firms to changes in prices and quantities.

Changes in number of egg type chicks hatched represent a measure of changes in commercial egg production plans. Data presented in Table 6 indicate the general positive relationship between the ratio of New York wholesale egg prices relative to feed cost and the change in egg-type chick hatch on an annual basis.

Table 7 also shows that the egg-feed ratio in a given year has a greater impact on the change in egg-type chick hatch in the same year than the change in hatch in the year following. This observation indicates that even though some lag would be expected, the hatch responds fairly quickly to changes in the egg-feed ratio. Monthly data indicate that the hatch tends to be most closely related to prices 2 months earlier.

While this relationship and the predictability of hatch may seem satisfactory, it is necessary to realize that there is considerable lag between hatch changes and corresponding cumulative changes in flock and egg numbers.

The price response to changes in supply on an annual basis has been difficult to estimate for several reasons: a) Egg production data collected on a sampling basis are subject to some error. The reduction of egg production by the number of eggs used in hatching provides a net quantity estimate that should more nearly correspond with prices for shell eggs for table use. The Commercial Egg Movement Report, which includes eggs received from producers by major handlers, provides an alternative supply figure. Table 8 indicates that the latter

<table>
<thead>
<tr>
<th>Year</th>
<th>Egg-feed price ratio</th>
<th>Egg-type chick hatch percent from previous year</th>
</tr>
</thead>
<tbody>
<tr>
<td>1966</td>
<td>10.3</td>
<td>116</td>
</tr>
<tr>
<td>1967</td>
<td>7.6</td>
<td>94</td>
</tr>
<tr>
<td>1968</td>
<td>9.5</td>
<td>96</td>
</tr>
<tr>
<td>1969</td>
<td>11.6</td>
<td>103</td>
</tr>
<tr>
<td>1970</td>
<td>10.2</td>
<td>108</td>
</tr>
<tr>
<td>1971</td>
<td>7.9</td>
<td>92</td>
</tr>
<tr>
<td>1972</td>
<td>8.0</td>
<td>93</td>
</tr>
<tr>
<td>1973</td>
<td>8.7</td>
<td>109</td>
</tr>
<tr>
<td>1974</td>
<td>7.6</td>
<td>89</td>
</tr>
<tr>
<td>1975</td>
<td>7.9</td>
<td>96</td>
</tr>
<tr>
<td>1976</td>
<td>8.6</td>
<td>108</td>
</tr>
</tbody>
</table>

* New York Fancy Large Egg Price (USDA) divided by the price per pound of laying ration.


* Published by USDA Market News based on data collected from cooperating egg packing plants.
Table 8. Relationship of changes in egg production, egg movement and New York wholesale prices actual and deflated

<table>
<thead>
<tr>
<th>Year</th>
<th>Production less hatching</th>
<th>Commercial egg movement</th>
<th>New York wholesale prices adjusted for WPI</th>
<th>Actual New York wholesale price</th>
<th>percent of previous year</th>
</tr>
</thead>
<tbody>
<tr>
<td>1966</td>
<td>101</td>
<td>101</td>
<td>115</td>
<td>119</td>
<td>115</td>
</tr>
<tr>
<td>1967</td>
<td>106</td>
<td>113</td>
<td>74</td>
<td>74</td>
<td>74</td>
</tr>
<tr>
<td>1968</td>
<td>99</td>
<td>104</td>
<td>113</td>
<td>116</td>
<td>116</td>
</tr>
<tr>
<td>1969</td>
<td>99</td>
<td>98</td>
<td>118</td>
<td>123</td>
<td>123</td>
</tr>
<tr>
<td>1970</td>
<td>102</td>
<td>100</td>
<td>89</td>
<td>92</td>
<td>92</td>
</tr>
<tr>
<td>1971</td>
<td>100</td>
<td>106</td>
<td>78</td>
<td>80</td>
<td>80</td>
</tr>
<tr>
<td>1972</td>
<td>99</td>
<td>102</td>
<td>98</td>
<td>102</td>
<td>102</td>
</tr>
<tr>
<td>1973</td>
<td>95</td>
<td>94</td>
<td>150</td>
<td>170</td>
<td>170</td>
</tr>
<tr>
<td>1974</td>
<td>100</td>
<td>100</td>
<td>83</td>
<td>97</td>
<td>97</td>
</tr>
<tr>
<td>1975</td>
<td>97</td>
<td>101</td>
<td>91</td>
<td>99</td>
<td>99</td>
</tr>
<tr>
<td>1976</td>
<td>99</td>
<td>101</td>
<td>108</td>
<td>112</td>
<td>112</td>
</tr>
</tbody>
</table>


supply figure shows larger annual changes than production less eggs used for hatching. The Commercial Egg Movement annual changes also appear to be slightly more closely related to price than the production less eggs used for hatching numbers. b) The changes in the number of eggs in storage, whether shell, frozen, or dried form, also affect the total available supply at any time and diversion for storage reduces the available egg supply and strengthens price in the short-run. c) The fact that egg numbers include small and medium sizes as well as large and that the proportion of each size varies seasonally means that changes in total egg numbers will not always explain the price for large eggs.

There are factors other than supply that may affect egg prices, but the data point up the need to improve the accuracy of information so that relationship between supply and price can be more accurately determined. This in itself would tend to encourage better industry response to available supply and price information.

INVENTORY AND RISK MANAGEMENT PRACTICES

Inventory and risk management practices can be discussed in three time phases: market period, intermediate and long-term. The market period inventory risk involves the possible change in price and quality during the process of marketing which is approximately a 2-week period. Market period inventory risks have been reduced as the marketing channel has been shortened in time and in numbers of transactions involved. The shortened channel reduces both price and quality risk. Transaction price changes as related to changes in base prices between the time of production and consumption still exist and while gains and losses may offset each other in the long-run, possible unfavorable price changes while in wholesalers' and retailers' hands can represent a part of the cost of doing business. The data in Table 9 illustrate the significance of price and quantity change for both wholesaler and retailer. The effect of an average change of 1.8 cents in the average store door price for Grade A white eggs for each week in 1975 was compounded by the fact that the changes occurred in the same direction for several successive weeks (the average in 1975 was four successive weeks). The short-term variation in quantities demanded is illustrated by the variability (5.6 percent) of retail egg movement in 12 areas which adds to the problem of price and quality change. The variability in individual areas is even larger as illustrated by the changes in weekly movements in the New York area.

In contrast, the receipts from producers reported by commercial egg handlers changed only an average of 1.6 percent each week in 1975. This comparison suggests that volume coming into the marketing sector is less variable than the volume that is moving out of the sector into ultimate consumption.

Table 9. Comparison of weekly price and movement changes in 14 metropolitan areas with selected other data—1975

<table>
<thead>
<tr>
<th>Description</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average weekly price change for Grade A large cartoned eggs in 14 metropolitan areas (store door delivery)</td>
<td>1.8¢ a dozen (2.9%)</td>
</tr>
<tr>
<td>Average number of weeks of same direction of price change in 14 metropolitan areas</td>
<td>4</td>
</tr>
<tr>
<td>Average weekly percent change of movement of eggs into retail channels in New York</td>
<td>6.5 percent</td>
</tr>
<tr>
<td>Average weekly percent change in movement of eggs into retail channels in 12 metropolitan areas</td>
<td>5.6 percent</td>
</tr>
<tr>
<td>Average weekly percent change in receipts from producers by commercial egg handlers</td>
<td>1.6 percent</td>
</tr>
</tbody>
</table>


Conclusions drawn from these data must be limited since the average weekly receipts from producers in 1975 was 1,473,000 cases, less than 50 percent of total production. Reported movements into 12 retail areas
Table 10. Comparison of egg margins and costs between producer and retail store

<table>
<thead>
<tr>
<th>Item</th>
<th>1970-73</th>
<th>1974</th>
<th>1975</th>
</tr>
</thead>
<tbody>
<tr>
<td>New York cartoned price, delivered store door, less producer price, Grade A large</td>
<td>15.1</td>
<td>17.8</td>
<td>18.0</td>
</tr>
<tr>
<td>Cost of assembling, processing, wholesaling, and delivering to retail stores</td>
<td>12.3</td>
<td>14.8</td>
<td></td>
</tr>
<tr>
<td>Unexplained differences</td>
<td>2.8</td>
<td>3.0</td>
<td></td>
</tr>
</tbody>
</table>

cents per dozen


The estimated costs. Wider differences in the case of retailing in 1974 from 1970-73 may reflect higher prices and somewhat greater volatility of prices. The 1970-73 average and part of 1974 may have been distorted to some extent by price controls during that period.

In the 10-year period 1966-75 the New York wholesale price for grade A large egg loose in cases (USDA) high month averaged 63 percent above the low month in the same year. The high month price was 28 percent above the average and the low month price 21 percent below average for the year (see Table 12).

Table 12. Variations in seasonal egg prices at different market levels 1966-75

<table>
<thead>
<tr>
<th>Item</th>
<th>High month percent of low month</th>
<th>High month percent of average</th>
<th>Low month percent of average</th>
</tr>
</thead>
<tbody>
<tr>
<td>New York Wholesale Fancy Large Loose USDA</td>
<td>163</td>
<td>128</td>
<td>79</td>
</tr>
<tr>
<td>New York cartoned delivered to stores of volume buyers, Grade A Large</td>
<td>153</td>
<td>124</td>
<td>81</td>
</tr>
<tr>
<td>In retail stores BLS Grade A Large</td>
<td>140</td>
<td>120</td>
<td>86</td>
</tr>
</tbody>
</table>


The New York carton price for grade A large eggs delivered to stores of volume buyers showed slightly less variation than the above “loose” wholesale price during the same period. The high month carton price averaged 53 percent above the low month. The high month was 24 percent above the average and the low month was 19 percent below. In contrast, the retail high month price averaged 40 percent above the low month. The high month retail price averaged 20 percent above average and the low month price 14 percent below the average for the year. It is evident that less seasonal variation occurs at successive stages up the marketing channel, from wholesale loose, to carton delivered, to retail prices. The difference in absolute variation is less than the percentage variation as the average price level is higher at each stage. Similar relationships can generally be observed in individual years.

The intermediate inventory risks arise from the changes in prices and changes in consumption from month-to-month in spite of great strides in reducing production variation. Month-to-month variation in egg production has been reduced, largely as a result of commercial operation. Technical developments have permitted flocks to be hatched.
grown, and started in production any month of the year without serious
differences in production. Furthermore, forced molting procedures have
permitted production to be stopped and re-started to some degree in
accordance with the operator's plans. This has extended the laying
life of a hen and has increased the total number of eggs that can be
obtained economically from a single layer.

Seasonal changes in commercial egg production shown in Table 13
indicate that egg production has become less variable as measured by
the difference between the high and low month of a particular year. Monthly
data have been adjusted for the different number of days in some months.
Not only is it shown in 3 selected years but by comparison of the 5-year
period 1965-69 with the 1971-75 period. Some continued leveling of
production will likely occur as forced molting becomes more widespread
and the results of its practice more completely known. Also, it will be
necessary that relative egg prices provide the necessary incentives.

Table 13. Seasonal changes in U.S. egg production less numbers used
for hatching

<table>
<thead>
<tr>
<th>Year</th>
<th>Percent difference between high and low month</th>
<th>High month as percent of average</th>
<th>Low month as percent of average</th>
</tr>
</thead>
<tbody>
<tr>
<td>1965</td>
<td>10 percent</td>
<td>105</td>
<td>95</td>
</tr>
<tr>
<td>1970</td>
<td>6</td>
<td>103</td>
<td>97</td>
</tr>
<tr>
<td>1975</td>
<td>4</td>
<td>102</td>
<td>98</td>
</tr>
<tr>
<td>1965-69</td>
<td>7.9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1971-75</td>
<td>5.9</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


Table 14. Seasonal changes in prices of New York Wholesale Fancy
Large Eggs—USDA

<table>
<thead>
<tr>
<th>Year</th>
<th>Percent difference between high and low month</th>
<th>High month as percent of average</th>
<th>Low month as percent of average</th>
</tr>
</thead>
<tbody>
<tr>
<td>1965</td>
<td>52</td>
<td>123</td>
<td>81</td>
</tr>
<tr>
<td>1970</td>
<td>94</td>
<td>143</td>
<td>74</td>
</tr>
<tr>
<td>1975</td>
<td>46</td>
<td>124</td>
<td>85</td>
</tr>
<tr>
<td>1965-69</td>
<td>62</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1971-75</td>
<td>36</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: U.S. Department of Agriculture, Market News and U.S. Department of Labor,

egg laying period is the significant factor but the unfavorable price
periods within a laying cycle often result in a negative cash flow to the
production stage.

The possibility of unfavorable prices occurring throughout a single
laying cycle is illustrated by Table 15. The 10-year period 1963-72 has
been used because of relatively stable feed costs as compared with
volatile feed costs and price controls which affected the situation in
1973-75. If it can be assumed that the 10-year average price is the

Table 15. Blend price for eggs, 1963-72*

<table>
<thead>
<tr>
<th>Year</th>
<th>Cents per dozen</th>
</tr>
</thead>
<tbody>
<tr>
<td>1963</td>
<td>27.9</td>
</tr>
<tr>
<td>1964</td>
<td>27.0</td>
</tr>
<tr>
<td>1965</td>
<td>27.4</td>
</tr>
<tr>
<td>1966</td>
<td>34.3</td>
</tr>
<tr>
<td>1967</td>
<td>23.7</td>
</tr>
<tr>
<td>1968</td>
<td>27.5</td>
</tr>
<tr>
<td>1969</td>
<td>35.5</td>
</tr>
<tr>
<td>1970</td>
<td>30.5</td>
</tr>
<tr>
<td>1971</td>
<td>22.1</td>
</tr>
<tr>
<td>1972</td>
<td>21.6</td>
</tr>
<tr>
<td>Average</td>
<td>27.75</td>
</tr>
</tbody>
</table>

* Blend price based on Iowa controlled production.
approximate cost of production (including return on investment and for risk), it can be observed that there are three sets of 2 consecutive years during which prices were below the average. This situation may be even more difficult for the small producer if his flock timing happens to result in peak production at the bottom of one of these low price periods.

The long term risk is also borne largely by the producer. It is the risk which is involved when the house and equipment are acquired. In the days of small production units, poultry houses were inexpensive and were a relatively small proportion of the total building investment on farms where poultry were kept. The large specialized egg production units are relatively more expensive. This combination of large units coupled with sizable costs of mechanical equipment represents a large investment on the part of the producer. It means that borrowing to acquire these facilities is almost always necessary. Most credit agencies require that amortization be on a relatively short period, usually 5 years if egg production units in general are showing good returns when the credit negotiations are underway. The repayment schedules typically assume that the ability to repay is regular and consistent each month and each year. However, the cycle of production of a particular flock, the unpredictable flock health problems, the extensive variation of egg prices as indicated in Figure 4, all mean variation in cash flow and ability to repay. While, in theory, fixed costs such as those represented by house and equipment can be set aside during periods of low returns and recovered in better times, the fixed repayment schedules do not permit any variation with great strain on the debtor and his other assets.

Risks are also experienced at the breeder and hatchery levels. In both cases fixed costs are a high percentage of total costs and the volume variation associated with the production cycle has a large impact on returns. These firms are also subject to the risks of changes in producer preference for layer strain.

The egg products manufacturers and users of frozen and dried eggs have played a major role in both seasonal and cyclical storage of eggs. Inventories of egg products are usually accumulated in spring and early summer when prices are low and reduced during the winter when prices tend to be higher. In addition to the seasonal stock manipulation the egg products users have often accumulated substantial inventories during periods of very low prices, a portion of which may be held for more than a year. In this way the egg products group has played a much larger stabilization role than one would expect based on the proportion of all eggs used for breaking.

### Table 16. Costs and returns at three stages in the production-marketing channel for eggs

<table>
<thead>
<tr>
<th>Item</th>
<th>1970-73</th>
<th>1974</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cents</td>
<td>Percent</td>
</tr>
<tr>
<td>Production</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Variable costs</td>
<td>19.9*</td>
<td>63</td>
</tr>
<tr>
<td>Semivariable</td>
<td>8.6</td>
<td>27</td>
</tr>
<tr>
<td>Fixed</td>
<td>3.0</td>
<td>10</td>
</tr>
<tr>
<td>Total</td>
<td>31.5</td>
<td>100%</td>
</tr>
<tr>
<td>Blend price received</td>
<td>30.2</td>
<td></td>
</tr>
<tr>
<td>Indicated return</td>
<td>-1.3</td>
<td></td>
</tr>
<tr>
<td>Assembly processing distribution</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Variable</td>
<td>(33.9)</td>
<td>83</td>
</tr>
<tr>
<td>Semivariable</td>
<td>5.8</td>
<td>13</td>
</tr>
<tr>
<td>Fixed</td>
<td>2.0</td>
<td>4</td>
</tr>
<tr>
<td>Total</td>
<td>42.2</td>
<td>100%</td>
</tr>
<tr>
<td>Price received</td>
<td>48.7</td>
<td></td>
</tr>
<tr>
<td>Indicated return</td>
<td>+2.5</td>
<td></td>
</tr>
<tr>
<td>Retailing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Variable</td>
<td>(48.7)</td>
<td>83</td>
</tr>
<tr>
<td>Semivariable</td>
<td>7.8</td>
<td>13</td>
</tr>
<tr>
<td>Fixed</td>
<td>2.3</td>
<td>4</td>
</tr>
<tr>
<td>Total</td>
<td>59.4</td>
<td>100%</td>
</tr>
<tr>
<td>Price received</td>
<td>61.2</td>
<td></td>
</tr>
<tr>
<td>Indicated return</td>
<td>+1.8</td>
<td></td>
</tr>
</tbody>
</table>

( ) Prices paid at that level.
* Variable cost estimated based on feed cost difference from 1974.
** 31¢ from Poultry and Egg Situation, March 1976.
variable or semi-variable cost depends upon the opportunity cost for the operator. In fact, in many instances labor returns are small if full evaluation of interest on investment and depreciation are considered. The variable costs on this basis of classification represent 60 to 70 percent of total costs.

The semi-variable costs of production are basically the flock depreciation charges. They are in reality intermediate term fixed costs as they can be eliminated at end of each flock cycle but are fixed for another 18 to 24 months once a replacement flock has been purchased. These costs represent 20 to 30 percent of total costs. The fixed costs of the production segment are the depreciation of the housing and equipment, the interest on such investments and taxes. These costs represent 8 to 10 percent of total costs. The residual returns for production became less favorable between the two time periods even though prices had increased.

Component two of Table 16 combines the functions of assembly, processing, transportation and distribution. Variable costs, which include product costs, increased rapidly from 1970-73 to 1974.

In contrast, the semi-variable and fixed costs have changed noticeably less. While specific figures are not available it can be interpolated that variable costs (especially product cost) will change more than semi-variable or fixed cost whether egg prices rise or decline. The comparison of these costs with realized margins for similar steps in the marketing process gives a difference which may be called a residual return. The margin was the difference between an estimated paying price to producers at the farm for large eggs and the New York cartoned price for Grade A Large delivered to stores. This difference can be explained as follows:

1. An amount to cover the market risk of changes in price and changes in quality while the product is in the hands of the marketing firm.
2. The margin data apply only to Grade A large eggs while costs apply to all eggs. It is frequently observed that egg handlers necessarily take a larger margin than average on their dominant and better quality line of eggs as represented by Grade A large to compensate for the lower margins that can be realized on the other sizes and qualities which they handle.
3. Differences in individual shipments may vary considerably as do margins and costs for particular lots of eggs.

It should be noted that the residual return had increased between the two periods along with other costs and prices.

A similar comparison was made for the retail segment in Table 16. Variable costs of retailing (containers and energy) from Rogers (31) and the product costs (the price for cartoned eggs delivered to stores), both moved at a similar rate between the two periods. However, the semi-variable costs identified as wages, salaries, etc. and “other” costs and the fixed cost identified as overhead both declined between the first and second period.

The difference between the total cost and the estimated margin increased from 1.8 cents a dozen in 1970-73 to 3.5 cents in 1974. The reasons for the difference would likely be the same as in the packer segment except that the retailer would not as likely be faced with the need to compensate for margins on the smaller sized or lower quality eggs by larger margins on the major line, Grade A large. Enterprises which have a high proportion of fixed costs generally require more capital per dollar of revenue than those with a lower proportion of fixed costs.

The production segment, therefore, requires more capital per dollar of revenue than is true of the marketing segments. Such a situation provides the marketing segments with the opportunity to adjust to competitive situations more readily than the production segments. In addition, fixed investments in production enterprises are more specialized (poultry houses, cages, feeders, etc.) than are fixed investments in marketing, which are such items as warehouses, trucks, etc.

The data cited here, while sketchy, indicate that the production segment appears to have a negative residual return (the difference between costs and margins). On the other hand, marketing segments have positive returns. It could be argued that a production unit could survive during a low price period when prices may only cover variable costs and these costs are lower proportions of total costs than in marketing segments. Such an assumption would prevail only if the unit had adequate equity capital.

However, if the capital for covering fixed as well as variable costs has been obtained by borrowing, payments for interest and principal for all costs still have to be met even in periods of low prices. Furthermore, this may explain the tendency for egg production units to integrate forward in marketing and backward into feed processing to overcome the effect of variability in producer prices by more nearly constant marketing and feed margins. On the other hand, feed concerns or egg marketing firms seem to be less likely to integrate into ownership of production units because of the potential dilution of the desirable effect of constant marketing or feed margins with variable production margins.

Several regional cooperatives have become the contractor-coordinator of egg production through the feed manufacture and egg packing functions. It is not clear whether the cooperatives entered these activities as an extension of egg producer-patron operations or whether the contracting function was entered to capture gains for the feed or marketing activities of the organization.
PRODUCT DETERIORATION

For many years it had been maintained that some part of the egg price spread between producers and consumers resulted from uncertainty regarding the decline in quality as eggs move through market channels. An early attempt at examining quality change, as an element in marketing costs was begun in 1948 by Hansen, et al., (12). This survey was made to determine the comparative quality of eggs at the first point of sale by producers and at car lot concentration points in the North Central States and Kentucky. In this step in the channel it was estimated that the value of lots of eggs on the average lost $28.30 per 100 cases or about 1 cent per dozen; $22.30 was because of interior quality and $6.00 because of shell damage.

Larzelere (19) followed this study with a more complete analysis of changes in egg quality in Michigan all the way from farm to retail store but through relatively direct channels in 1949 and 1950. The results indicated that 55.8 percent of the eggs had declined one quality level between the farm and the retail store ready for sale to consumer. The average margin between these levels was 17 cents a dozen. In 1949 and 1950 the average difference in value in several terminal markets for 1 grade change (Grade A to Grade B) was 5.4 cents a dozen. The application of the above percentage meant that shipments in general lost about 3 cents a dozen in value because of change in quality, 2.5 cents to changes in interior quality and .5 cents to shell damage. It might be expected that reducing changes in quality would be associated with increases in costs owing to more and better facilities for refrigeration and more rapid movement during marketing. In this study, however, lower margins were associated with less quality change and higher margins with more quality change. It can be, therefore, inferred that quality losses were reckoned as a part of the cost of marketing along with labor, transportation and other items.

In the pre-World War II years the conventional wisdom of the egg trade was that actual grading of eggs should be done in terminal market areas as near the ultimate consumer as practical to insure eggs of desirable quality getting to consumers. It gradually became evident that the grading could be done at lower cost at a grading station in a production area than in a city market area. Hourly wage rates were considerably lower in the country and labor with adequate skill to grade and handle eggs at a country point was at least as readily available in the country as in the cities. In addition, hauling all eggs including inedibles and low quality to the terminal market before diverting to other outlets added cost. The producer-consumer margin under the terminal grading procedure was larger than necessary. As a result, producer groups organized cooperatives and a few other dealers, realizing that the process of quality change starts the minute the egg is laid, began to buy eggs from producers on the basis of grade rather than on “case count.” Improvement of general quality from this change in practice was evident from the above cited studies.

These changes helped induce egg producers who were serious about improving their egg returns to expand the size of their production units. Other factors such as improved disease control, reduced space needed per bird, increased mechanization, increased efficiency of feed utilization and improved breeding made large production units feasible.

Marketing agencies soon discovered that procurement and grading costs were materially reduced when production units were large and concentrated. This resulted in buying eggs on grade and paying premium prices to large producers. Cost reductions were not only due to the mechanics of handling and transporting eggs in larger quantities but were also due to the tendency for eggs from large flocks to be of better quality than eggs from small flocks.

These changes could be expected as large production units naturally tended to be able to correct the major causes of interior egg quality deterioration, namely time, temperature, humidity and handling (41).

An example of this practice could be noticed when the USDA Market News Service began reporting egg prices paid at farm in Iowa in two categories in 1962. Both were for Grade A large eggs. One category was designated for those eggs produced under quality and volume incentive programs and the other called “other production.” The difference between these two in 7 months in 1962 averaged 3.2 cents a dozen in favor of the first category. Some of this difference undoubtedly reflected expected potential quality changes in later steps in the market channel. This difference increased to an average of 5.3 cents a dozen in 1965-69 and to 9.7 cents a dozen in 1974 and 11.8 cents in 1975.

Similar quality and volume incentive programs have developed in other areas of the country and have become characteristic of new egg production areas.

It can be concluded that the present-day large scale production and marketing units have made great strides in reducing the interior quality changes between producer and consumer. Shell damage continues as a concern since the mechanical handling and washing procedures sometime cause breakage which not only results in losses of the specific eggs involved but also slows the entire processing procedure when breakage does occur.

One of the factors characterized as shell damage was cleanliness of the shell. Modern production technology with layers in cages with roll-away and collection devices has reduced some of the natural opportunities for egg shells to become dirty. Washing has become standard pro-
THE PRODUCER-PRODUCED-ACME-GARDEN is an example of a double-partnered service function. Under these circumstances, the production operation, involving the coordination of production activities, is often carried out by a single producer or a group of producers. The key to the successful operation of such a service function is the ability to coordinate the activities of the various partners involved, ensuring that the production process is carried out efficiently and effectively.

TRANSACTION COSTS

Transaction costs of the service function are generally considered to be significant factors in determining the overall cost of the service. These costs include the cost of purchasing or producing the goods or services required for the service, as well as the cost of operating the service itself. In many cases, the transaction costs associated with the service function are significant enough to make it worthwhile for the service provider to invest in developing and implementing efficient transaction cost reduction strategies.

RESOURCE UTILIZATION

Resource utilization is a critical factor in determining the effectiveness of a service function. In order to ensure that resources are used efficiently, it is important to carefully plan and manage the flow of resources throughout the service function. This may involve developing strategies for optimizing resource allocation, as well as implementing systems for monitoring and controlling resource usage.

NONASSIGNMENT OF PRODUCTS

In cases where a service function is not assigned to a specific partner, the costs associated with the service function are often borne by a group of partners. This may result in a need to carefully consider the allocation of resources and the assignment of tasks in order to ensure that the costs associated with the service function are shared equitably among the partners involved.
ments, written or verbal, with a very low average transaction cost borne primarily by the seller. Cost of change includes considerations similar to those at the producer-packer level plus packing materials which may carry a store brand. Sales to hotels, restaurants and institutions are likely to be on a similar long-term arrangement.

There remains an important trade in shell eggs between packers and from producers and packers to the egg products manufacturing industry. Transaction costs are high in the former. Egg Clearinghouse, Inc. brokerage is 0.5 cents per dozen not including membership costs. Transaction costs at a fraction of that would be possible with much larger volume of trade. An informal telephone search is also expensive and may not result in an optimum trade. Costs associated with sales to breakers are lower primarily because there are so few buyers. The seller needs to contact a limited number of buyers for an open market trade. Many sales, particularly of undergrades, are made on a price-date-of-shipment basis to a single buyer with routine transaction costs limited to scheduling.

Ownership integration and contracts play an important coordinating role. The result is a system for which average transaction costs are believed to be relatively low but the cost of change may be quite high. Dominance of nonprice coordination in the market period means that the information normally carried in the price system must be obtained by other means when a change is to be made. The high marginal transaction cost under present institutional arrangements probably does operate to impede change in long-standing vertical coordination arrangements. It may also reduce effective competition among firms at several levels in the subsector.

**Progressiveness**

The egg subsector has been progressive. The subsector has made revolutionary changes in processes and organization which transformed a loosely coordinated subsector made up of many small firms at each stage to a capital intensive, industrialized subsector in less than 30 years. Free entry into production and marketing assured adoption of process improvements almost as quickly as they became available.

Substantial economies to scale, which new technology made available, brought new entrepreneurs and new areas of the country into the business of producing and marketing eggs. Costs of production using the new methods were significantly below costs of the systems being replaced, and recurring low price years tended to eliminate the producers who did not change.

At the same time, that free entry insured early adoption of breeding, production and marketing system advances, rapidly concentrating breeder and equipment manufacturing stages were providing the genetic material and machinery to maintain the advance. Progressiveness at these stages has been in the form of products, whereas at subsequent stages process progress has been much more important.

The final products of the subsector are basically unchanged. However, quality has been vastly improved, and the high quality egg has become an all-season product. This change is illustrated by the fact that, in 1950, grade and yield selling by the producer was a marketing innovation and in the early 1970's nest-run trading is an innovation. Yesterday's premium quality is today's expected quality.

The egg subsector, with other poultry subsectors, has been a leader in nonprice coordination arrangements. The perishable nature of the product, the need for continuous supplies and at times the need to shift risk-bearing led to the development of a variety of contract and owner-integrated systems.

MATCHING SUPPLY OFFERINGS WITH DEMAND PREFERENCES

The relatively wide price swings, both seasonal and cyclical, indicate deficiencies in matching supply offerings and demand preferences of buyers. But, on the other hand, the quantity variation which has apparently been responsible for large cyclical price swings has been minuscule compared with quantity variation often observed in other products.

The subsector has been relatively quick to respond to price change. A completely harmonized change in output level from breeder to retailer would require as much as 5 years, but large changes in output are made in much shorter time periods. Very substantial changes are accomplished in 18 months (a period sufficient to reflect the full impact of a change in hatch level) and significant change can be made in a few months through the use of forced molting and changing the length of the laying cycle.

Most of the volume adjustment must be accomplished at the production stage with some very short-term shifting of supply from week to week accomplished by changes in shell egg inventories. Amounts going to breakers are also adjusted with egg product stocks varied both seasonally and cyclically.

Hatch levels may be changed quickly because of the tendency to maintain excess capacity for hatching egg production. Substantial seasonal variation in hatch results in an excess supply of hatching eggs from a less seasonal production system during nearly two-thirds of the year. There is also a tendency for hatcheries to maintain hatching egg production in excess of even peak season needs. Hatchery operation represents a high fixed cost activity and the hatchery manager typically maintains excess egg production capacity to avoid missed sales of chicks.
This excess breeder hen number was also encouraged by the method of payment for breeder chicks sold to hatcheries by breeders. In the past, a common arrangement was for the hatchery to pay a small fixed amount per breeder chick plus a royalty for all chicks hatched to the breeder firm. Such payment methods left a substantial amount of the risk of breeder hen ownership in the hands of the breeder. The royalty method of payment has been replaced by outright sale to a large degree. This excess capacity has kept the subsector more flexible to respond to changes in demand at the consumer level than would otherwise be the case.

If one measured the cost of maintaining slight excess capacity in hatching egg production in terms of the cost per dozen of eggs actually produced, it has probably been a relatively low cost way to maintain some additional flexibility in the system.

The various nonprice coordination systems, in particular contracts and long-term “arrangements” which base transfer prices on other markets, may have introduced some inflexibility into the system. For instance, it is common for prices to retailers to be based on New York wholesale prices during the previous week. This process means that the system is attempting to supply consumers on the basis of an out-of-date price. If the price is going down, this lag may accentuate the downward price movement by delaying consumers’ response, price increases are likely to be overdone in a similar manner.

Another case of a contract induced rigidity is the producer payment based on a flat fee per dozen or a payment incentive based on feed conversion. The flat fee payment may leave the integrator in a negative cash flow position toward the end of the lay cycle but he may not be able to liquidate a flock because of his agreement with the producer. Incentive payments on the basis of feed conversion may prevent the contractor from feeding an optimum nutrient density feed if a high density feed would result in a more favorable feed conversion and a resulting increase in grower payment. Any of the contracts with a transfer price based on the market price will have some tendency to increase the magnitude of changes in the market price because any adjustment needed must be made by the noncontract portion of the market.

Generally, none of the participants in the egg subsector is in a position to influence supply or demand. The basic breeder, in an oligopoly situation, has operated in a very competitive manner. None has been likely to agree to supply control at the breeder level. With high fixed costs and relatively low variable costs the incentive is high to set the price and sell all the customer wishes to buy. The number of firms at all other stages beyond the breeder are sufficiently large to prevent any conspiracy to control supply. Efforts to obtain legislation to authorize supply control have continually been defeated by the aggressive competitors who believe they can make profits while others are losing money. There has been no lack of recognition of the potential benefit of supply control but a refusal of the aggressive firms to accept a no growth or low growth role.

The Egg Research and Promotion Order adopted by producers during 1975 is the first really substantial effort on the part of the egg producers to influence the demand for eggs. It will be some time before an evaluation of that effort is possible.

Production response to reduced demand or lower prices is inhibited by the fact that resources committed to egg production other than feed and labor typically have no other use. Buildings and equipment are highly specialized, and of course, the hen is of little value other than in egg production. Negative profits over a period of time are necessary to force resources from production. Once a flock is in production, feed is the only major out-of-pocket cost. Thus, very substantial reductions in prices are necessary to induce a short-term change in production.

Today's production is geared to delivery of substantially all high quality product. Both state and national programs exist to monitor quality of eggs moving in commerce and for most of the country, quality is not a problem.

Allocation of eggs among outlets is basically a function of price although there is a tendency for sellers of eggs to attempt a two-price system. That is, processors may sell table quality eggs to breakers at low prices in an attempt to hold the Unger Barry price quote (which affects the price on all other sales) high. As pointed out earlier, the ability of breakers to grade and carton table eggs discourages this practice to some extent. Packer margins are generally wider for cartoned egg sales than for loose packed product going to other packers or to breakers. Thus, the net return to the firms who are able to keep production coordinated with retailer needs or who are able to work with their retailer customers on pricing and store specials will tend to be higher than for those who are less able to coordinate supplies and needs.

**COMPETITIVE ENVIRONMENT IN SUBSECTOR**

If the question “Who has the most power in the egg subsector?” were asked of the trade, one would expect the retail chain buyer to receive the most votes. The retailer controls access to the consumer, and there is evidence that the retailer's profit per foot of shelf space for eggs has been larger than for most other products utilizing the same type of shelf space (24). The retailer is perceived as being in position to push prices lower.
It has been argued that the supply of eggs to the retail level is relatively unresponsive to short-run price changes. This situation would provide an opportunity for the exercise of buyer market power. We have also argued that consumer demand (and therefore retailer demand) is even less price responsive. The retailer cannot face the customer with an empty egg display which leaves the retailer group powerless to hold retail price below the market clearing level. The retailer’s power, if exercised, would be reflected in margins in excess of cost or as buying price advantage possessed by large retailers over smaller buyers. While retailer margin may be increased by their power position, it is not likely that the retailers can depress the entire structure of prices as is believed by many in the trade.

Aggressive competition among egg producers has led to offers to retailers at lower and lower levels relative to the commonly used base price. The effect of this widely lamented “premium erosion” has simply been to raise the base price and the level at which transactions are actually taking place (See Table 2). The result is the quote being forced up rather than the price being forced down. This change is no more the result of retailer power than of producer pressures to keep the quote high.

It is more significant to note that the retailer takes a larger margin to store the product for 3 to 5 days and to move it fewer than 100 yards than does the processor who moves it from the farm to the store, grades it, packs it in cartons and absorbs the grading loss in the process. That may be evidence of power, but difficult-to-measure retail costs may explain the margin.

To a lesser degree the marketer with a retail outlet may enjoy some pricing discretion. But he must keep prices in line to maintain the retailer’s business and to obtain supplies.

The basic breeder and associated hatcheries may enjoy some power when their product is popular. As already indicated, this power is often transitory but could increase if the stage becomes even more concentrated.

It is clear that the independent single house producers possess no market power at all. Acting alone, the small producer is not even in a position to do a thorough job of shopping for feed, pullets or an egg marketing service. Neither are major producer organizations engaged in activities to improve the lot of the small producer as such. Cooperatives have been the only means of balancing the power of firms dealing with the small producer.

Access to markets has been relatively free at all stages in the egg subsector except at the basic breeder level. Access to genetic material and the very high cost of developing a product at that level have been an effective barrier to entry for a number of years.

A large amount of market information is available to all participants except the small operators. The smallest operator could have access to the same information; however, its cost may not be justified. Information regarding contracts or details of formula pricing arrangements are not readily available at any level in the system. The large firm is of course more likely than small firms to obtain such information.

Most changes and contract negotiations are price competitive. The retailer-buyer may be able to exert some pressure for service or price concession from the seller because of the fear of losing an account. Similarly the egg products manufacturer may exert some pressure on the egg seller with an implied threat of refusal to buy when egg supplies are over-abundant. These pressures are likely more imagined than real. Loyalty and friendship are probably worth less than one-half cent per dozen to the honest buyer. A dishonest buyer could no doubt make decisions without regard to price, but this would more likely be at the expense of his employer than at the expense of the seller.

The number of firms exiting all stages of the subsector during the past 25 years as firm sizes increased. At the breeder level it has been almost entirely exit. Few firms have entered as hatcheries in recent years; however, integrating producers have entered the hatchery stage. Similarly, few have entered solely as shell egg processors, but many large producers have entered with processing capability or have added the egg processing and marketing function.

CAUSES OF AND DEGREE OF CONFLICT

Conflict in the subsector has more often been between the established firm and the newcomer or between those who would like agreements (or orders) to limit production to insure profits and those who wished to enlarge their market share. Often this conflict took on a regional nature, e.g., Northeast and Midwest vs. South. Efforts to stabilize the subsector (voluntary or mandatory) have met defeat.

Contract arrangements have not been as much a source of major conflict in the egg subsector as in other poultry enterprises, Rogers (32). The producer has, until now, had an alternative to contracting. Apparently he has not believed himself at the mercy of the contractor. If there is a viable choice, conflict can be avoided or kept at a low level.

The problem of pricing has been a source of conflict. Producers appear to believe that use of the Unrue Barry price quote has been forced upon them by the buyer. This, linked with a belief that the UB quote has been biased downward, generated a feeling of lack of choice and, therefore, conflict.
FORCES CAUSING CHANGE AND PROBABLE DEVELOPMENT OF THE SUBSECTOR

The egg subsector remains a mostly competitive and fundamentally market determined system. The technical progress in breeding, materials handling and nutrition combined with easy entry into production and marketing has literally driven the system toward improved performance. The stream of innovation forced people to adapt or depart.

There is little indication that the stream of innovation will slow or stop. If it does not, the entry of new production and marketing firms will likely continue. The number of firms will continue to decline but probably not to the point that the hatchery through packer stages will no longer be essentially competitive.

Viability of the independent one-house production operation is a major unanswered question. To date the decentralized production system has existed side-by-side with the integrated in-line production packing complex. If the integrated complex is as effective as its proponents claim, the face of the subsector will change greatly during the next 10 years.

The relatively concentrated stages of breeders and equipment suppliers have been the source of much of the subsector progressiveness. They appear to continue to behave very competitively with no evidence of stable shares. In both cases the domestic firms compete with foreign firms. The breeder and equipment markets are world-wide and there is little evidence that it will cease to be competitive even though the number of firms is small.

The retail trade is concentrated and is already accused of exerting considerable power over the egg subsector. That power is somewhat limited because eggs can be distributed outside food stores. Therefore, there is an upper bound on margin. Egg production is sufficiently responsive to price that prices cannot be unduly depressed without causing a shortage of product. These conditions are not likely to change rapidly.

There appear to be a number of coordinating arrangements and patterns of integration operating side-by-side without clear evidence that one is superior under all conditions.

This analysis does not indicate that the characteristics of the subsector will change in a more dramatic way. The trend toward elimination of the small production units will continue for some time. The process accelerates during periods of low prices and slows or stops when prices are attractive to the producer.

At times it appears that the independent packer is in the most vulnerable position. Cartoning often appears as an attractive addition to the egg producer. If the in-line production and packing arrangement does emerge as a superior alternative, the independent packer will disappear even more quickly.

The complex nature of short-run coordination of the egg subsector is a major factor in the predominance of non-price coordination arrangements at all levels of the subsector. It is clearly impractical to sell the output of individual farms on a daily open market and equally impractical to supply retail stores on a daily open trading basis. The costs of assembly and distribution plus the impact of uncertainty associated with such a system would be prohibitive.

But the efficiencies of nonprice coordination arrangements (agreements, contracts or ownership integration) are gained at the expense of the pricing process. The system, as presently organized, depends upon the existence of a base price to determine the transfer prices for most transactions in commercial egg channels. The efficiencies associated with nonprice coordination probably are much greater than the cost of less efficient price discovery. The problem of pricing has been a major concern of subsector participants for years; and the existence of Egg Clearinghouse, Inc., represents a direct result of such concern.

A lack of public price information has, no doubt, been a factor in encouraging further integration. In this way the decline of open markets has fed upon itself. The success or failure of institutions such as ECI and the amount of other information regarding transactions which is publicly available will affect the vertical organization of the subsector in the future. More public information would be expected to slow the rate of integration. The lack of public information increases private transaction costs which encourages internalizing vertical linkages.

Increased trading on open markets such as ECI and/or on an appropriately specified futures contract would generate useful information, as well as facilitate access to markets. Development of ECI trading is hampered by the fact that the cost accures to the trading firm, but substantial benefits accrue other information users. The subsector would likely benefit from subsidized trading, that is, nontraders bearing part of the cost of open trading.

Analysts would benefit from separate reporting of egg production and layer numbers for commercial market and for hatching. These additional data would benefit firms in both egg and broiler operations.

Cost studies at all stages of the subsector are needed to aid firm planning as well as to assess subsector performance. New analyses of economies of size for stages other than production are needed to replace data now 10 to 20 years old. Accurate assessments of physical or organizational efficiency are not feasible without new cost studies.

The future of the demand for eggs and the associated question regarding the relationship of egg consumption to human health are
central to the development of the subsector. Without government interference or effective producer union the subsector is expected to remain essentially competitive, efficient and progressive. This conclusion is independent of whether the demand for eggs increases or decreases as long as the decrease is by a relatively small amount (say 1 percent per year). More rapid decline would, no doubt, discourage many from new investment and retard progress in the subsector.

REFERENCES


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