The Economic Feasibility of Assuring U.S. Grade A Quality of Fresh Seafoods to the Consumer

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Introduction

This study was conducted to determine the effects on sales of guaranteeing U.S. Grade A quality of fresh seafoods to the consumer, recognizing that benefits would accrue to both the consumer and the seafood industry. The technology of achieving this goal was already largely known at the beginning of this study 3 years ago. What was not known was: 1) Whether the technological conditions to achieve and to preserve the U.S. Grade A quality of fresh fish fillets would be adopted by the industry; 2) whether the implementation of those conditions would, as expected, entail additional costs; and finally, 3) whether consumers would buy the product at the expected higher prices.

To find the answers, a study was conducted in three phases between November 1975 and September 1977 with funds from the Northeast Fisheries Center's Gloucester Laboratory and the New England Fisheries Steering Committee. The species under observation were cod, flounder, haddock, ocean perch, pollock, and whiting. Cusk was included in Phase II. All three phases involved a single processor in Gloucester, and each phase involved a different supermarket chain.

The findings of Phases I and II have been reported (Ronsivalli et al., 1978). This work helped to determine the operating parameters which assure the U.S. Grade A quality seafoods to consumers; it also established that the acceptance of the program by both the processor and the supermarkets was high, that consumers were satisfied and willing to pay a higher price for U.S. Grade A fish, and that sales tended to increase when the U.S. Grade A label appeared on the package and the quality was, in fact, high.

This paper, although incorporating the major findings of the previous two phases of the study, is primarily concerned with the third phase of the study which covered the 21-week period between 11 May 1977 and 30 September 1977. The objective of this phase was to study the economic feasibility of assuring U.S. Grade A quality at point of sale. The supermarkets used as test stores were those of a large northeast chain located in Milford, Gardner, Arlington, and Marlboro, Mass. The first two were test stores which were supplied with USDC graded fillets and the last two were control stores which were supplied with ungraded fillets from the usual sources of supply.

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ABSTRACT- Results of a 2-year study demonstrated that, when the quality of fish fillets at the point of sale was of U.S. Grade A quality, benefits accrued to the consumer, the retailer, the processor, and potentially the fisherman. Sales tended to increase up to 20 percent and, at most, the extra cost to assure U.S. Grade A quality was 10 cents per pound. Since the high quality product commanded about 50 cents per pound more than its non-guaranteed counterpart, it is concluded that even if the estimated added cost is in large error, economic feasibility has been demonstrated. Private enterprise has adopted the guaranteed U.S. Grade A procedures developed by the government. Based on new sustained sales for a period of more than 1 year, currently valued at $3,000,000, the benefit-to-cost ratio of the Federal investment of about $200,000 is more than 15:1.

Procedure

The work started with the formulation and publication of a U.S. standard to cover fresh, unfrozen fish for the first time. This was necessary because the U.S. Grade A label can be used only on products for which Federal standards exist (Ryan, 1971). A detailed description of the most recent official standards is contained in the Federal Register (1977).

In brief, for fish to be classified as U.S. Grade A, a number of criteria have to be met. In addition to the observance of U.S. Department of Commerce (USDC) guidelines for sanitary control throughout the entire chain of production, especially important is a set of particular handling, filleting, and packaging techniques which assure the existence of wholesome boneless fish fillets that are free of defects. These techniques lower the yield and contribute to raising the cost of producing U.S. Grade A quality fish. But, these Grade A quality fish commanded higher prices in the market.

Early in this study it was decided that fresh fish should be sold through

supermarkets in order to reach the largest number of consumers and that fish should arrive at the supermarket prepackaged for sanitation, customer convenience, and to facilitate store handling. Each tray was machine-overwrapped and heat-sealed in clear plastic film. A label (Fig. 1) displaying the U.S. Inspection sticker, the U.S. Grade A mark, the logo of the New England Fisheries Steering Committee, the species name, and the packing date was affixed to each retail package. Ventilated master cartons were used to transport the trays from the processor to the retailer. The master carton prevented damage during transit. The temperature during transit was controlled to about 32° F (0° C).

Figure 1.—Combined U.S. Grade A label used to identify particular species and blank label requiring hand-stamping for underutilized species.

Temperature control throughout the entire chain of production and distribution was confirmed to be of extreme importance (Ronsivalli and Charm, 1975). When the temperature rises from 32° F (0° C) to 37° F (2.8° C), the approximate fillet shelf life drops from 14 to 8 days, and beyond 37° F (2.8° C) it is shortened even more. Temperature should be kept at a near-constant 32° F (0° C) for optimum results. This temperature has been found to prevail when fish is unloaded from most fishing vessels (Kaylor and Murphy, 1970). In order to maintain this temperature level throughout the subsequent distribution chain, it was necessary for National Marine Fisheries Service (NMFS) technologists to recommend more stringent temperature controls which the industry readily implemented. These included chilling the fillets overnight (when they were not delivered the same day that they were processed), use of ventilated master cartons, use of liquid CO_2 coolant while in transit during hot days, the avoidance of piling and crowding of trays in the retail display cabinets, and the maintenance of temperature control in the display cabinets.

As a consequence of these controlled conditions, through an analysis of 69 reports from USDC inspectors during Phase III of the study it was ascertained that the quality level of U.S. Grade A fillets in the two test stores was retained for a minimum of 5 days. This is a significantly longer shelf life than the 3 days usually expected by managers of retail outlets.

It is evident that the shorter the production/distribution time, the longer the shelf life of the product at the retail level, and the higher the probability of selling the product as U.S. Grade A. The time required to produce and distribute the product varies primarily in accordance with the number of tasks to be performed (as indicated in Fig. 2), the availability of facilities for the performance of those tasks, and the efficiency with which each processor performs those tasks.

Combining these three factors in the most efficient manner, it has been estimated that a prototype processor can obtain the following sequence of events: 1) unloading of fish early in the morning, 2) completing the production of 10,000 pounds in 8 hours, and 3) delivering fillets to the supermarket warehouse during the same day (or early next morning) for distribution to the retail stores immediately thereafter. Delivery to the retail stores should also be so scheduled that they never remain without a stock of each desired species.

In the course of this study, the strict quality monitoring required that a

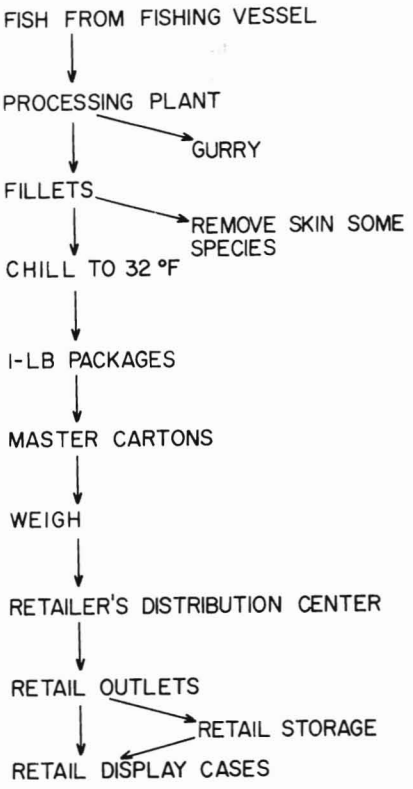

Figure 2.—Handling sequence of U.S. Grade A unfrozen fish fillets.

major departure from the normal inspection procedure be made. Fish were not only inspected at the processor but also at the retail level. After determining that fresh fish fillets retained their U.S. Grade A quality for at least 5 days at the retail display counter, it became obvious that except under unusual circumstances, inspection would be necessary only from the fifth day onward. Since this comprehensive inspection procedure was necessitated by the study, its cost was borne by the support funds for the study. Also, fillets that were found to fall below Grade A quality while on display were removed and replacements were supplied at no cost to the retailer.

No advertising or promotional effort was made. However, throughout the program, the Gloucester Laboratory furnished the stores with informational placards emphasizing the high quality of the product, and these were displayed over the U.S. Grade A guaranteed fillets.

Temperature data were collected at the test stores by laboratory personnel. Data on deliveries and prices concerning the two control stores were provided by the retailer. Other economic data were collected by laboratory personnel directly at the test store or plant level as an adjunct to the technological study. Data on costs and cost estimates were obtained through ad hoc studies.

Table 1.—Selected socio-economic characteristics of communities in which test stores and control stores were located during Phase III of the study.

	Milford[1]	Gardner[1]	Arlington[2]	Marlborough[2]
Total population	19,352	19,748	52,524	27,936
Mean income[3]	$9 617	$9,069	$11,622	$10,408
Foreign stock from	7,264	8,918	6,134	7,318
Canada	801	5,311	1,394	2,433
Italy	3,686	195	939	1,553
Ireland	409	206	733	721
U.K	324	193	530	473
Poland	199	789	—	258
Other countries	1,845	2,224	2,538	1,880

[1]Test stores
[2]Control stores
[3]For all families and unrelated individuals
Source U.S. Census of Population, 1970

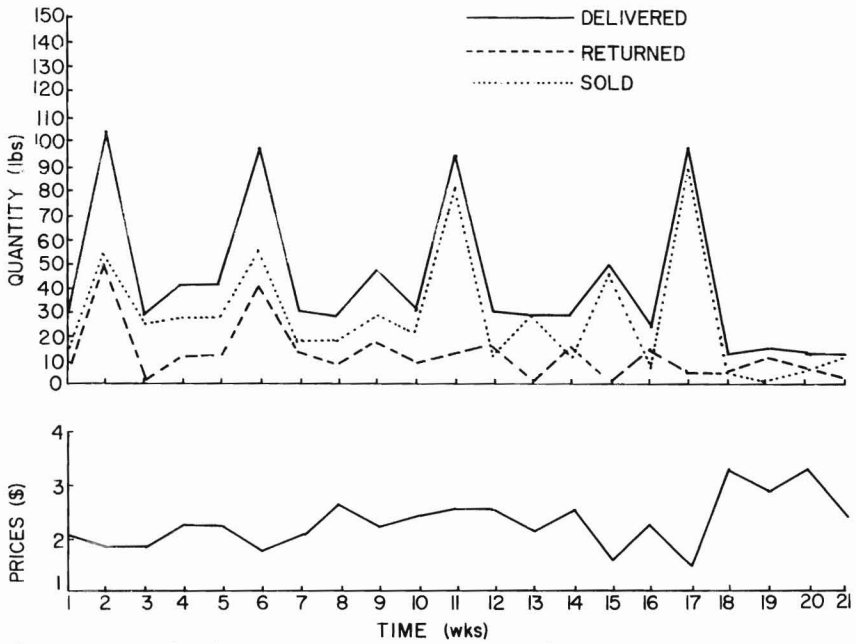

Figure 3.—Deliveries, returns, sales, and prices of cod fillets at the Milford store.

Economic Feasibility

Sales Trends

Sales trends, prices, costs, and profit margins are analyzed below. Retail stores do not generally keep records of the amount of fresh fish discarded or of the fish that they often sell at discount at about Saturday noon. Hence, it was impossible to make an independent determination of sales trends in relation to previous years. The estimates provided by the retailer indicate that there was a 2 percent increase during 5 months of the study over the comparable 5 months of the prior year in the two test stores, and a 7 percent increase in the two control stores.

For selected socioeconomic data on the communities in which the stores are located, see Table 1. A typical example of sales trends for one species is provided in Figure 3. Estimates provided by the retailer during Phase II of the study indicate that sales increased by 20 percent (Machiaverna, 1977) and that in a similar program instituted by a 26-unit chain of supermarkets in Phoenix, Ariz., sales increased by 67 percent in a period of 7 months (Zwiebach, 1978).

More important than any such piecemeal estimate, however, is the fact that there now exists an enterprise which directly or indirectly was created through the performance of this study. In a 2-year period, sales of U.S. Grade A fresh fish fillets have grown from a nonexisting quantity to approximately 30,000 pounds per week. Assuming an average retail value of $2.00 per pound, the new enterprise is currently valued at approximately $3,000,000 a year.

Prices at Three Levels

Three levels of prices were observed for each species: ex-vessel, processor, and retail prices. Ex-vessel prices were taken from the New England Fish Exchange in Boston as they are the

only ones available. Processor and retail prices were recorded for each delivery. (Detailed retail prices are given in Tables 2, and 3; ex-vessel and processor prices can be calculated from Table 5.)

Analysis of data concerning the three price levels (Fig. 4 is one typical example) reveals that with a few exceptions, the three price levels tended to move in parallel for all species. Since fillets represent only about one-third of the total weight of the fish from which they are removed, their cost must be trebled in relation to the ex-vessel cost of the fish. This trebled cost must be psssed on to the retailer who passes it on to the consumer. This accounts for the difference between processor sale prices and ex-vessel prices being generally larger than the difference between processor sale prices and retail prices.

Two observations stand out in relation to retail prices: 1) With the exception of whiting, retail prices for all species had a tendency to increase (Table 2); and 2) with the exception of the price of whiting, the spread between the minimum and maximum price was quite large — from 90 cents for pollock to $1.90 for cod (Table 2).

These two observations acquire greater significance when prices of fish are compared with retail prices of a selected group of other products. The trends of these prices are shown in Figure 5. These prices were collected in the test stores for each week in which prices of fish were observed. Two facts stand out in relation to meat and poultry prices: 1) With the exception of sirloin steak and whole chicken, prices were rather stable during the course of the observations; and 2) the relative spreads between minimum and maximum prices were consistently and markedly narrower than price spreads for fish. This last phenomenon has been isolated and is shown in the "window" of Figure 5 on selected comparative prices.

Comparisons among various retail price spreads are considered to be so significant that they have been plotted again and are shown in a different format in Figure 6. Selected comparisons make it possible to draw two more observations: 1) With the exception of whiting, the highest price spreads consistently occurred for seafood products; and 2) the prices of seafood items were generally higher than those of chicken and beef.

These observations go a long way to

Table 2.—Retail prices of U.S. Grade A fillets in test stores, 1977.

Date	Cod	Flounder	Haddock	Ocean perch	Pollock	Whiting
5/11	$1.99	$1.99	$2.99	$1.99	$1.57	—
16	1.79	2.59	2.49	2.19	1.99	—
23	1.79	2.49	1.89	1.99	1.49	—
6/01	2.19	2.39	2.99	1.79	1.69	—
07	2.19	1.99	2.89	2.39	1.69	—
13	1.69	2.99	2.59	2.19	1.99	—
20	1.99	2.99	1.89	1.79	1.59	—
27	2.59	—	2.79	2.09	1.79	—
7/05	2.19	2.59	2.79	2.19	1.59	—
11	2.39	2.79	2.79	2.49	1.69	—
18	2.49	2.69	2.69	1.89	1.49	—
25	2.49	2.59	2.89	2.09	1.09	—
8/01	2.09	2.99	3.49	1.99	1.79	$1.49
08	2.49	3.29	2.99	2.19	1.09	1.49
15	1.49	3.49	2.29	2.39	1.69	1.39
22	2.19	3.49	—	1.85	1.79	1.39
29	1.39	3.19	2.39	1.99	1.79	1.49
9/06	3.29	2.79	3.29	2.79	1.79	—
12	2.89	2.79	2.99	2.19	1.99	1.49
19	3.29	3.29	3.09	1.99	1.99	1.49
26	2.39	3.49	2.39	1.99	1.09	1.49
Average	$2.25	$2.85	$2.73	$2.12	$1.65	$1.47

Overall average: $2.32 (in order to make data comparable with data in Table 3, this figure excludes the average of whiting.)

Source: Study data.

Table 3.—Retail prices of ungraded fillets in control stores, 1977.

Date	Cod	Flounder	Haddock	Ocean perch	Pollock
5/09	$1.79	$2.39	$2.59	$2.29	$1.89
16	1.99	2.59	2.29	2.19	1.29
23	1.79	2.39	2.59	2.29	1.89
30	1.99	2.59	2.29	2.19	1.29
6/06	1.99	2.59	2.29	2.19	1.29
13	1.59	2.49	2.09	1.79	1.29
20	1.69	2.39	1.99	1.99	1.09
27	1.69	2.99	1.99	1.99	1.29
7/04	1.69	2.49	1.99	1.79	1.09
11	1.99	2.49	2.29	1.39	1.39
18	1.49	2.49	1.99	1.09	1.09
25	1.49	2.59	1.79	1.79	.99
8/01	1.69	2.69	1.49	1.89	1.09
08	1.49	2.59	1.79	1.79	.99
15	1.69	2.69	1.49	1.89	1.09
22	1.49	2.59	1.79	1.79	.99
29	1.69	2.69	1.49	1.89	1.09
9/05	1.79	2.49	1.89	1.89	1.09
12	1.69	2.59	1.79	2.29	1.29
19	2.39	2.59	2.49	2.49	1.29
26	2.29	2.49	2.39	2.39	1.39
Average	$1.78	$2.57	$2.04	$1.97	$1.25

Overall average $1.92

Source: Study data.

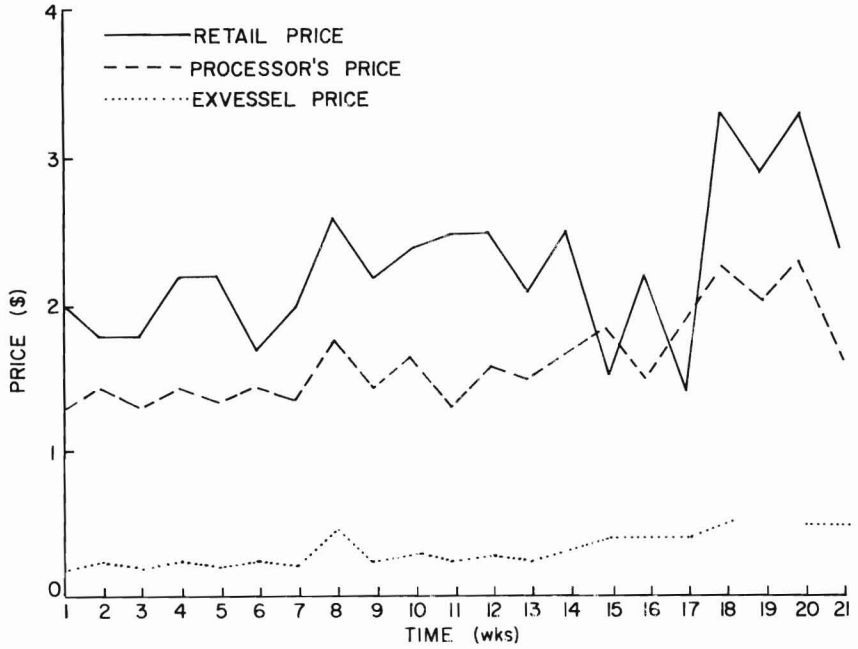

Figure 4.—Ex-vessel price of head- on/eviscerated cod and prices of cod fillets at processor and retailer levels.

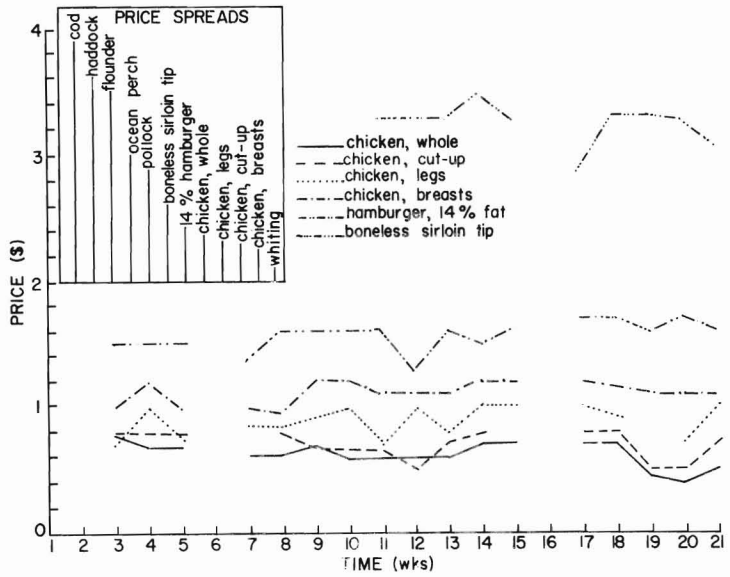

Figure 5.—Prices of selected beef and chicken products and price spreads of these and fish fillets.

explain the low growth rate in sales observed during Phase III of this study. The evidence suggests that the erratic pattern of prices and the occasional or seasonal unavailability of particular species of fish make it rather difficult to build wide consumer confidence and loyalty for seafood products. In addition, if the per capita consumption were inversely related to price, then poultry, which has a lower price than meat, would have a higher per capita consumption, but it does not. It is possible, therefore, to conclude that price of fish is not the major determinant of sales, but perhaps much more important is the erratic behavior of prices.

These observations suggest that, even assuming a priori a higher cost of a guaranteed quality program of seafood sales, the higher cost is no barrier to the introduction of the program to the market. It is better, however, to observe this issue of costs in a separate section and in a more comprehensive fashion.

Cost Estimates and the Efficiency Level

This section reports on those costs which could be determined within the scope of this study. Costs also vary from plant to plant, and especially in relation to the efficiency level of the operation. Especially as a consequence of inspection costs, the capacity of the wrapping machine, and transportation costs, the minimum efficiency level for the U.S. Grade A fillets is obtained when the production schedule reaches the level of 10,000 pounds per day. No effort was made to determine the upper limit of this range.

Information on costs was obtained through ad hoc surveys. The basic information, assumptions, and calculations for the cost estimates developed in this study are provided in Table 4. It was not possible to obtain direct information concerning overhead costs nor was it possible to estimate them with any degree of accuracy. Since independent calculations would need to be too broad to fit the specific cases, they would have very little theoretical or practical value. Entrepreneurs know their own overhead costs and can use their costs where appropriate. The following paragraphs, therefore, attempt to provide information which an entrepreneur eventually interested in developing a quality control program does not have.

Prototype Processor Costs

Cost estimates given in this section do not relate to the actual costs of the processor collaborating in this study. The preparation of U.S. Grade A fish fillets represents only one among many operations conducted in that plant. In addition, the Guaranteed Quality Program is still in continuous evolution. The costs of that plant, in other words, even if they could have been determined with any degree of confidence at any particular time in this study, would be of little general value. For the majority of costs listed in this study, it has been deemed more appropriate, therefore, to try to reach estimates based on a prototype processing plant which has obtained a minimum efficiency production schedule of 10,000 pounds per day. It should be noted that the estimate is only possible from observations during this study. In order to obtain an understanding of the costs involved at the processor level to assure U.S. Grade A quality, cost estimates are given for producing U.S. Grade A and ungraded fillets.

Table 4.—Cost estimates for producing one pound of fillets when production capacity is 10,000 pounds per day.

U.S Grade A fillets		Ungraded fillets	
Ex-vessel price	[1]$0.29	Ex-vessel price	$0.29
Gurry	[2]0 63	Gurry	[3]0.55
Master case	0.08	Wooden boxes	0.03
Tray, pad, film	0.057	Tin cans, wax paper	0 04
Specialized filleting	[4]0 04	Filleting	[5]0.03
Specialized packing	[6]0 04	Random packing	[7]0 03
Wrapping machine	[8]0 001		
Inspection	[8]0 006		
Transportation	[8]0 02	Transportation	[8]0 02
Overhead		Overhead	
Total	[9]$1 16	Total	[9]$0 99

[1]Average price per pound for the six species observed during this study
[2]On the basis of following fillet yields. Cod, 29%, flounder 28%; haddock, 38%, ocean perch, 27%, pollock, 36%, whiting 30%
[3]On the basis of following fillet yields Cod, 37%, flounder 30%; haddock, 41%, ocean perch, 27%, pollock, 44%, whiting, 34%
[4]Estimate based on assumption of 200 pounds per hour at $8.00 per hour
[5]Estimate based on laboratory experience of 275 pounds per hour at $8 00 per hour
[6]Estimate based on assumption of 180 packs per hour at $7 70 per hour
[7]Estimate based on laboratory experience of 240 packs per hour at $7 70 per hour
[8]Detailed calculations are available upon request Labor costs in the operation of the wrapping machine are estimated to be 31 cents per pound
[9]To these costs must be added respective overhead costs
Source Study data

As can be seen from Table 4, it costs about $1.16 per pound to produce U.S. Grade A fillets and about 99 cents per pound to produce ungraded fillets. Thus, it appears that a processor would incur an additional cost of 17 cents per pound in order to meet the more stringent requirements imposed by the Guaranteed Quality Program.

Prototype Retailer Costs

Direct labor costs for a prototype retailer are estimated to be about 15 cents per pound, and since about 7 cents per pound is saved when fillets arrive at the market in prepackaged form, as was done throughout this study, "net" labor costs amount to 8 cents per pound of product.

As stressed above, U.S. Grade A fillets which are not sold by a preset date should be frozen while still of U.S. Grade A quality and sold as U.S. Grade A frozen fillets. When this is done, additional savings accrue which can be at least as high as 10 cents per pound. Yet, this step was not sufficiently explored in the program as developed so far. If retailers elect not to freeze the unsold items, they must include the normal cost of returns; namely, 8 cents per pound. In that case, the total retailer costs can be estimated to be 16 cents per pound. It must be stressed that overhead costs are not included in this estimate.

Cost to Insure U.S. Grade A Quality

In order to obtain a clearer understanding of the costs involved to produce U.S. Grade A fillets, they have to be compared with the costs involved in producing ungraded fillets. To facilitate direct comparisons, some of these calculations have already been developed in Table 4. It is better, however, at this point to recapitulate the issues and to separate them.

So far, it has been observed that processor costs to produce U.S. Grade A fillets are 17 cents higher than for producing ungraded fillets. At the retail level, the situation changes. Here, there are saving in direct labor costs of 7 cents per pound due to the establishment of the Guaranteed Quality Program: Packaging and wrapping in retail trays is no longer done as for ungraded fillets at the retail level. It is done at the processor level. Thus, the difference in costs between the two operations observed at the processor level (17 cents per pound) is reduced by the amount of savings in labor costs (7 cents per pound) experienced by the retailer. The difference in costs between the two operations can therefore be

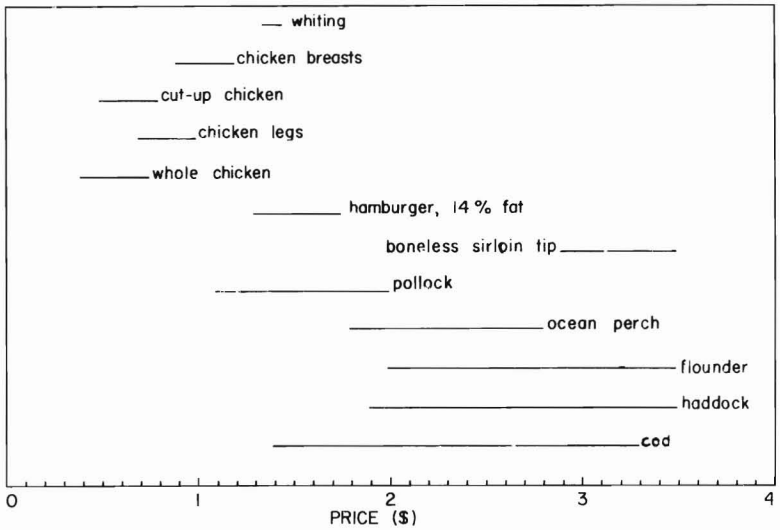

Figure 6.—Price spreads of U.S. Grade A unfrozen fish fillets and selected meat and chicken products.

estimated to be about 10 cents per pound. This estimate represents the added cost of the Guaranteed Quality Program as determined in this study.

In particular, it must be noted that the cost of returns cannot be considered as an additional cost imposed by the Guaranteed Quality Program. Even under current practices, retailers tend to discard about 5 percent of the deliveries; and since these percentages are assumed to be identical, the cost of this item is nearly identical in both cases.

Indeed, there is the potential that instead of suffering the cost of returns, one may obtain additional savings in a Guaranteed Quality Program which is efficiently run. As stressed throughout this study, fillets which are not sold one day before the U.S. Grade A shelf life is scheduled to end should be frozen and sold as U.S. Grade A frozen fillets. (This efficiency measure can hardly be taken with ungraded fillets whose quality may not be suitable for freezing). If returns are in fact sold as U.S. Grade A frozen fillets, the cost of producing U.S. Grade A fillets becomes at least identical to producing ungraded fillets. The additional cost of 10 cents per pound, attributable to the Guaranteed Quality Program, is offset by the 10 cents per pound that can be saved by freezing fillets before they reach the end of their U.S. Grade A shelf life and merchandising them as U.S. Grade A frozen fillets.

This result should come as no surprise. By increasing efficiency and reducing waste of resources, the ultimate economic purpose of technology is to lower costs—or at least to keep them stable.

Gross Profit Margins

This section deals with profit margins for processing and retailing U.S. Grade A fillets. It should be stressed that since there are no estimates on overhead costs, what can be determined are only "gross" profit margins. They are given for both the prototype processor and the prototype retailer by the difference between markups and costs. (Data to make comparisons with gross profit margins for ungraded fillets were not available to this study. This lacuna is not crucial because those profit margins are generally known to the trade.)

Table 5.—Mark-ups (Overhead costs have to be subtracted from these values).

	Processor mark-ups over Ex-vessel prices with yield factored in						Retailer mark-ups over processor sale prices					
Date	Cod	Flounder	Haddock	Ocean Perch	Pollock	Whiting	Cod	Flounder	Haddock	Ocean Perch	Pollock	Whiting
5/10	$0 62	$0 68	$0 56		$0 65		$0.69	$0 52	$0 59	$0 57	$0 50	
16	0 58		0 60		0 70		0 36	0 99	0 84	0 84	0 73	
23	0 62	0 71	0 29				0 49	0 89	0 29	0 64	0 49	
6/1	0 58	0 71	0 50	$0 54	0 63		0 76	0 79	1 04	0 66	0 62	
6	0 63	0 58	0 58		0 65		0 82	0 52	0 99	0 90	0.62	
13	0 59	0 15	0 62				0 26	1 06	0 39	0 84	0 73	
20	0 66	0 54	0 59	0 62	0 65		0 62	0 99	0 09	0 58	0 52	
27	0 16		0 59		0 50		0 84		0 89	0 67	0 60	
7/6	0 59	0 55	0 59		0 65		0 76	0 79	0 89	0 70	0 52	
11	0 61	0 47	0 59	0 54	0 66		0 76	0 86	0 89	0 84	0 56	
18	0 49	0 55	0.62	0 72	0 64		1 19	0 89	0 89	0 61	0 49	
25	0 59	0 59	0 56	0 68	0 58		0 92	0 93	1 04	0 74	0 09	
8/1	0 65	0 53	0 25	0 57	0 70		0 59	0 86	1 14	0 64	0 54	$0 50
8	0 62	0 47	0 61	0 56	0 65		0 79	1 03	0 94	0 70	0 02	0 50
15	0 41	0 50	-0 03	0 46	0 60		-0 34	1 03	0 74	0 75	0 50	0 40
22	0 08	0 50		0 65	0 75		0 69	1 03		0 57	0 48	0 40
29	0 48	0 53	0 41	0 25	0 68		-0 51	1 06	0 14	0 59	0 53	0 50
9/5	0 54	0 50	0 80	0 59	0 70		1 05	0 86	1 04	0 87	0 53	
12						$0 76	0 86	0 93	1 09	0 70	0 61	0 50
19	0 60	0 48	0 57	0 61	0 68	0 76	0 99	1 03	0 94	0 64	0 61	0 50
26	-0 03	1 28	0 33	0 61	0 52	0 76	0 76	1 03	0 74	0 57	0 01	0 50
Average	$0 49	$0 57	$0 51	$0 57	$0 64	$0 76	$0 66	$0 90	$0 78	$0 70	$0 49	$0 48

Overall average. Processor mark-ups. $0 59. Retailer mark-ups, $0.67

Note. Negative numbers relate to sales at a loss
Source. Study data

As can be seen from Table 5, the average markup for the prototype processor is calculated to be 59 cents per pound, and the average markup for the prototype retailer is calculated to be 67 cents per pound.

On the basis of the given cost estimates, the prototype processor would experience a gross profit margin of 35 cents per pound (59 cents minus 24 cents) and the prototype retailer would experience a gross profit margin of 51 cents per pound (67 cents minus 16 cents).

The reader is reminded that: 1) These estimates refer to gross profit margins because they do not include overhead costs; and, 2) they refer to a prototype processor and a prototype retailer because cost estimates developed in this report relate to an estimate of a prototype situation. The actual retailer and the actual processor involved in this study may have obtained a greater gain or a lower one; we do not know. Finally, it is to be recalled that ex-vessel prices in Gloucester are generally 2-3 cents per pound lower than Boston prices, on which this analysis is necessarily based. Therefore, if the above gross profit margin were to be applied only to Gloucester processors, it would need to be raised by 6-9 cents per pound because when the yield is factored in, each cent in ex-vessel price automatically counts for approximately 3 cents.

Cost-Benefit Analysis of Study

The total cost incurred by this study over a 2-year period was $218,000. This cost has to be assessed in relation to benefits which, as of the date of this writing, can be measured as follows:

1) A large northeastern chain of 234 stores has implemented for the second year in a row the Guaranteed Quality Program in nearly all of its stores.

2) A small but aggressive New England supermarket chain has implemented the Guaranteed Quality Program in all of its 21 stores.

3) Two of the nation's largest chains are now testing the program in a number of stores.

4) A large northeastern chain has demonstrated interest in the Guaranteed Quality Program and is conducting pilot tests on its own.

5) Two suppliers, one in Gloucester and the other in New Bedford, are now producing U.S. Grade A fillets. Other suppliers from New Bedford, Boston, Providence, and Gloucester have demonstrated an interest in the program and two of these are already negotiating with supermarket chains.

6) Personnel in all of the retail stores involved in this study have been enthusiastic about its procedures and results. They have indicated, for instance, that consumer complaints, which are a normal occurrence, disappeared completely during the test period.

The series of activities has resulted in a gradual but constant expansion of sales either directly under the U.S. Grade A label or through the adoption of techniques quite similar to those developed in this study. At present, in accordance with USDC inspectors' reports, such sales have reached a level of about 30,000 pounds per week. At an average retail price of $2.00 per pound, this amount corresponds to an average of $60,000 per week or $3,000,000 per year. A specific study of these sales would reveal not only that they substantially represent a new product on the market, but also that they do not displace existing fishery products; such a study would also reveal other benefits such as increased employment and value added. Therefore, the benefit to cost ratio of this study, based on retail sales alone, is approximately 15:1. As this enterprise is expected to grow, this ratio will grow with time.

A more detailed analysis than is warranted here would reveal the existence of many other actual and potential benefits to be derived from this study. In particular, five potential benefits need to be mentioned—even though no attempt is made to quantify them: 1) Elimination of consumer complaints, 2) elimination of financial loss to consumers, 3) higher sales, 4) enhanced image of industry, and 5) facilitation of introduction of underutilized species.

So far, at least two processing firms have found it advantageous to adopt those advanced technological methods and processes which have been analyzed in this study; and experience shows that such technology can easily be incorporated into other processing plants. But, more importantly, if some of the economic benefits of the introduction of this program are passed along to fishermen, the introduction of further technological advances can eventually affect all processes which are related to the harvesting of fish.

Finally, the implementation of this program tends to eliminate the losses that are normally associated with spoilage throughout the distribution chain, thus resulting in greater utilization of our seafood resource.

In summary, as a result of this study, the notion of the assurance to the consumer of high and consistent quality of seafood products has been introduced to a small segment of the industry. And the program, although deserving continuous monitoring and specific assistance at various critical points, is receiving increasing and widespread acceptance.

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