INCREASING THE DEMAND FOR FARM PRODUCTS BY IMPROVING QUALITY TO MEET CONSUMER DEMAND

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The impact upon aggregate demand of improving the quality of various farm products is not likely to be large. However, impacts of such quality improvements upon particular products may be of consequence and may have considerable regional significance. The brief topic outline provided by Professor Shepherd emphasizes improvement of animal products. I suppose that emphasis assumes some validity in the "multiplier analysis" that animal products require more resource expenditures than cereals, vegetables and fruits.

The phraseology of the title is worthy of examination. "To increase demand" means to shift the demand curve to the right. Merchandisers of manufactured consumer products talk knowingly about the complementary roles of price, product and package in projecting a "product image." Quality improvements in this context must be accompanied by prices which testify as to the validity of the quality promoted. In the roller-coaster world of farm product prices, it is an important question whether increases in demand through quality improvement represent movement of the entire demand curve to the right or only certain portions of it.

What does it mean to improve quality? These four definitions as applied to a product each have their proponents.

(1) "Cost" -- quality is measured by the amount of resources expended in production.
(2) "Standards" -- quality is measured by absolute standard applied by experts in nutrition or husbandry or technology.
(3) "Sales" -- _ceteris paribus_, the better quality product is, the inferior one.
(4) "Preferences" -- _ceteris paribus_, the better quality product is, in some sense, "preferred" to the inferior one.

It should be apparent that these definitions may sometimes conflict.

An examination of the broiler case illustrates the type of definitional conflicts which can arise. Consumption of broilers in 1958 greatly exceeded the consumption of farm chickens for, say, 1940. By the sales definition the

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Broiler is a quality improvement although the relative decline in price violates the ceteris paribus proviso. I rather suspect the standards of the nutritionist and poultry husbandryman might differ as to whether the broiler is a quality improvement. The "costs" definition would not describe the broiler as a quality improvement. What about preferences? I feel confident that the cut-up, tray-packed broiler is visually preferred to the New York dressed fryer. I doubt that for equivalent sized birds, there is any pronounced difference in eating quality as perceived by consumers. Thus, we have observed a tremendous increase in the sale of broilers which is associated -- depending upon your definition -- to a great or small degree with a quality improvement.

I shall generally adhere to the preferences definition. I interpret the seminar topics to mean that I should be concerned with farm products as such and not with packaging or promotional changes.

Product Design and Grading. The improvement of quality of farm products -- by whichever definition -- is related to the problems of grading and product design. The diversity in quality of many agricultural products has very often been considered a positive benefit to consumers and/or producers. Diverse qualities are supposed to match the supposedly diverse preference maps of consumers, so that community satisfaction exceeds that which would prevail with a uniform quality. Other authors emphasize -- also, or instead -- the potentialities of dividing markets and practicing effective price discrimination by means of natural diversity in quality.

Since farmers are rarely in a position to benefit from price discrimination we shall be little concerned with that argument.

I think it useful to our thinking -- and no farther from the truth -- to argue that wide diversity in quality is not of benefit to consumers nor producers. Corollaries are these propositions:

1. Grading is the process of making the best of a poor situation;
2. Design of "an optimum product" of general acceptability will satisfy more consumers and sell more units than the best possible grading of units into "Good", "Pretty Good," "Almost Good" and "Poor".

These propositions appear to be true for milk sold to consumers in fluid form. I suspect that they are true for eggs and broilers. On the one hand, modern production and distribution methods promise to so reduce the cost differential between egg grades as to threaten the price appeal of the inferior grades. On the other hand, broiler grades appear to be based on rather inconsequential factors and can hardly be expected to be superior to a simple USDA "Quality Approved" label. As technological innovations and good product design bring increasing product homogeneity in other farm products, these propositions will apply to them.
The case for beef may appear much stronger than for milk or broilers. The argument for the usefulness of beef grades was recently stated as follows:

"One of the principal functions of grades is to channel each unit of a commodity into its highest valued use, that is into the form and use for which it is best suited. The Federal grades for beef appear to have contributed to the effectiveness and precision of this channeling and distributing process. The Prime grade, for instance, is channeled into high valued use in the restaurant trade; Choice is sold predominately by retailers in medium and high income areas; the Good and Standard grades are sold principally to retailers in low and medium income areas and to highly price conscious customers while the remaining grades are directed primarily to processors and manufacturers of prepared meats."\(^1\)

While this socially desirable process of channeling each unit into its highest use is similar to price discrimination, it is not price discrimination because the production costs of these units vary widely and, in the same direction as their prices. Suppose that some tremendous feat of processing (at nominal costs) could make uniformly acceptable all the beef from the various grades. On the demand side, the more elastic segments would no longer have to accept beef of widely varying and sometime unsatisfactory quality. Surely, quality improvement would increase sales in these important market segments. On the other hand, as a consequence of our assumption, the more inelastic segments could continue to receive the same quality.

The greater impact would be on supply and upon its regional and specialized components. Within a generally free market,\(^2\) we would not expect vertical competition between product qualities to persist without a difference in cost matching the difference in quality (as both cost and quality differentials are perceived by the buyers). Therefore, a leveling of the quality of beef would place the production of the more expensive beef at a disadvantage. I will argue later that this complete leveling of quality is not at hand but that some leveling is more than a wild dream. I need not spell out the implications for the corn belt.

Recapitulating, I have questioned whether the present natural quality diversity of even so heterogeneous a product as beef is better for producers and consumers than homogeneous quality. I believe that in a day when

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2/ It must be admitted that present market imperfections are substantial and that imaginary differences in quality may for a long period influence the market.
standardization and repeatability are the watch-words, that it can be plausibly argued that beef producers and consumers would benefit from homogeneous quality to the extent that can be obtained. In any case, we need more emphasis on product design of agricultural products. Whether there are multiple qualities or one quality, these "products" of this "product" should be designed to suit the buyers. Such design will often transgress the "cost" and/or the "standards" definitions of quality. Compromises with "standards" may sometimes be advisable, but the designer must not become entrapped by cowboy lore nor the ideals of technical perfectionism.

For a number of important agricultural products, "quality" is what the grading service says it is. This identity of grades and quality indicates the accepted usefulness of the grades. At the same time, the grading service assumes a heavy responsibility in the case of products in which its definitions could be considerably wide of the mark without being generally realized by the trade. Economists have paid too little attention to the defining of grades and to the long run performance and structure of an industry of the substitution of more price competition for less quality competition.

I shall briefly summarize a few concepts concerning grading which Professor Kiehl and I have previously specified.

1. The assumption that all consumers' preference maps are identical is a necessary but not a sufficient condition for the justification of rank-ordered grade names. To state or imply by grade names that the grade preferred by one group is superior to the grade preferred by another group is misleading.
2. An unwillingness of some consumers to exchange some units of a product for other units at an equal substitutionary rate is a necessary but not a sufficient condition for grading.
3. Sensory differences (eating and/or visual) would appear to be a necessary but not a sufficient condition for consumers to place differing economic values on differing product units.
4. "An optimum grading system should classify as alike or as 'in a grade' all those products consumers value the same."^4/

In retrospect, I do not consider these conditions unduly severe, unless one gratuitously interprets the "optimum" goal as a necessary condition. Their shortcoming appears to lie in the omission of sufficient conditions for grading. The sufficient situation seems to me to involve so many judgmental

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4/ Ibid, page 45
factors concerning the social benefits and costs of grading as to be impossible of simple statement.

**Some Research Results and Interpretations.** What is beef quality to consumers? What grades do consumers prefer? There have been numerous publications of preference results of various types. There have been even more numerous "interpretations" given by the researchers and interested observers. Under such conditions, a brief summary may be useful.

The early studies of visual preferences indicated that consumers' preferences were, indeed, diverse. The least popular grade usually came up with at least one-sixth of the first-place votes and the most popular with only one-third or, in some cases of only three grades, one-half. Much ado was made about the most popular grade (characteristically chosen by ranking three or four grades of loin steaks in a display under an explicit assumption of no difference in price). In our own study,\(^5\) Prime had a slight edge in popularity, while Good was definitely more popular in studies in each of three western states.\(^6\) In all cases, the popularity of the leaner grades was sufficient to cause surprise and even concern on the part of some observers. These visual preference results suggested widely differing preference patterns of consumers. Of the several factors affecting consumer's choices, the most important were amount and color of lean and assumed eating characteristics. It was readily apparent that consumers differed widely with each other and with "experts" as to the visual indications of eating quality. This disagreement led us into research concerning eating preferences. At this point, we were forced to make a shift in our attack with important implications which often are not understood. The visual studies tested the preferences of people for given, standardized products. The eating studies have never gotten much beyond the stage of testing products in terms of a composite preference of consumers. The difference arises from the amount of available product of known homogeneity. In a large laboratory eating test, we learned that judges could discriminate between loin steaks from two animals within one third of a grade with almost the same accuracy as they could discriminate between two animals in non-adjacent grades.\(^7\) Accurate testing of eating preferences for grades or for any products requires homogeneity in each product tested. Since that homogeneity does not exist in present beef grades, our preference tests describe mainly the distribution of

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\(^7\) V. James Rhodes, et. al., Consumer Preferences and Beef Grades, Mo. Res. Bul. 612, 1956.
carcasses within a grade. It is true that we have paired off a number of carcasses from two grades and have reported the total number of preferences. The so-called higher grades have obtained a majority of the preferences, although individual carcass pairings have not been as consistent. It should be apparent, however, that the preference totals depend upon the particular pairings.

This diagram shows the range and distribution of carcass ratings given short loins from 84 carcasses by a panel of 266 St. Louis men (Figure 1). The mean general acceptability rating of each carcass (obtained twice from 12 to 14 men in as many neighborhoods) is shown on the ordinate after being translated from a descriptive, hedonic scale to a numerical one. Number 1 is equivalent to "like extremely" and number 9 is equivalent to "dislike extremely". The range of carcass means is broken into thirds by shading to indicate more clearly the intra-grade distributions. The experimental design and internal evidence indicate that most of the variation stems from differences in carcasses and not from differences in consumers' preferences. Note that in the region above a rating of four are the means of all 42 Prime and Choice carcasses, more than two-thirds of the Good grade and almost one-third of the Standard grade. This tremendous over-lapping of grades as to carcass acceptability has been the result most difficult to accept. The greater intra-grade heterogeneity of carcasses as one proceeds toward the leaner grades is also larger than expected. We have found the same results with short loins from 80 more carcasses and are now embarked upon a similar test which will eventually involve over 500 more carcasses. If these results are again confirmed, then very serious attention must be given to the problem of improving grades. The best third of Standard and the best two-thirds of the Good grade were premium products which were "wrongly" labeled as inferior products. One of the claims now being made for Choice is that its greater homogeneity as compared with Good reduces the risks to the merchandiser of disgruntled customers. The social cost of this reduction of risk is the extra pounds of fat placed in the retail tallow barrel or, more properly, the resources which produced that excess "rind". Please note that these decisions of retail merchandisers are relatively immune from the constraints of consumers because of the current lack of knowledge in this area.

If and when beef can be graded according to its acceptability, how many grades should we have? Any answer must be based considerably upon judgment even though we apply the theoretical conditions for grading stated above. I would


9/ "The simple fact is that adjoining grades so over-lap that preference results can be greatly affected by chance pairings." V. James Rhodes, "Relationship of Physical Product and General Acceptability Ratings," in Conference on Consumer Preferences, University of Missouri, Mimeo, September, 1957.
Figure 1

Federal Grades of Beef

Distribution of Carcasses (Loins) by grade, St. Louis panel

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say two grades with the dividing line at about 3.5 on this scale and the lower limit of the second grade at 5.0. Products below 5.0 might better be improved by tenderizing techniques or be sold as processed meats. For a time perhaps, we should continue to separate out Prime as a special grade to protect the show circuit, although the perennial divergence of carcass and live animal show-ring results should be sufficient warning.

Would two grades be sufficient for the diversity of consumer eating preferences? Our admittedly incomplete evidence suggests that eating preferences are not terribly diverse. For example, in one test we had pairs of families compare several steaks from pairs of loins. Preferences of families were considerably different for only 24 of 60 comparisons.10/

What about the potentialities of tenderization by enzymes, by high temperature aging or by other means? Each of these methods show promise, but no real break-through has as yet been accomplished. The apparent success of several well-known steak houses with tenderized, leaner grades suggests that tenderizer may be used most effectively in a carefully controlled commercial environment. Lack of tenderness is frequently a limiting characteristic in beef. We have reason to believe that the natural variation in juiciness, texture and flavor is small. Moreover, most roasts and many steaks undergo severe cooking treatment and often receive additives during or after cooking which rather effectively mask natural variations in juiciness, texture and flavor. Therefore, a break-through in tenderization could have a great impact upon the acceptability of leaner grade carcasses. The consumer ideal of tasty, tender and lean beef would be obtained.

Another change in the beef industry may be nearer at hand. The Grading Service has been discussing the possibilities of adding "cutability" (retail yield of trimmed, salable, popular cuts) as a grading factor. As is usually the case, the idea is being received with mixed emotions by the trade, and its ultimate acceptance is uncertain.

The importance of the idea for our discussion is that retail yield is inversely related to the degree of finish. The Grading Service reports that these yield variations are of considerable importance. Pierce has reported that a difference of 4.05 percent was found between average yields for the high and low yielding groups within the Choice grade, 500-600 pound group. Individual carcass variations are reported of as much as 9 percent yield of preferred cuts in the Choice grade, which at present prices he valued at about ten dollars per hundred weight.11/ Pierce indicated his belief that the

10/ Rhodes, et. al., Bul 676, page 15
11/ John C. Pierce, Jr., "Beef Grading Studies", Arms Mimeo of talk given at College Station, Texas, August, 1958. Yield is slightly related to conformation also.
industry has not yet recognized the total impact of yield upon carcass value, although many buyers will reject an especially "wastey" carcass.12/ I know of a few instances where buyers pay a premium to enter the packer cooler to select carcasses and they choose not the Choice most like Prime but the lean, high-yield Choice carcasses most like Good. The wide recognition of these yield results would likely make lean Choice carcasses (mostly "low Choice") more valuable than any other Choice carcasses. Such recognition should also cause a re-evaluation of the merits of the higher yielding, leaner grades. However, the fact that about four times as many low Choice as high Good carcasses are being rolled with the federal grade indicates something of the retailer demand for that U. S. Choice government grade label.13/

Perhaps I have dealt too specifically with one commodity. I hope that this discussion does indicate the importance of forces at work in one industry as they bear upon the problem at hand.

What is quality in pork as viewed by the consumer buyer? Can we find an additional retail value for lean pork that can be added to its already recognized cut-out advantage?

Several attempts to answer those questions have been made, and none have produced really conclusive results.

Ordinary interviewing studies of visual preferences for pork cuts confirmed the overwhelming preference for lean cuts.14/ Some small-scale sales tests at Iowa and Illinois indicated that lean cuts would sell materially better than fat cuts.15/ However, investigators generally found a visual sorting for leanness superior to the use of Federal grades in selecting "lean" products. These very promising beginnings have not yet been verified with similar large scale results. Trotter's Pittsburg sales test in eight stores found that lean and fat pork cuts (center cut chope and pork steaks) sold equally well regardless of the price differential. Part of this buyer insensitivity to fat/lean differences may have been due to some experimental control problems and to the fact that a large proportion of buyers never perceived the full range of alternatives in the displays.16/

12/ Ibid.
13/ Williams, et. al, op. cit., page 45
Our own sales test involving hams and loins from 9,000 hogs sold through 14 chain supermarkets for eight weeks found that lean cuts sold as well as regular cuts at a four cents a pound premium for the lean. Lean cuts sold somewhat better than regular cuts almost 3:2 when priced the same.\(^{17}\)

I participated in this Kansas City test; I am confident as to the adequacy of the experimental procedures: I quietly watched many consumers select from the displays; I expected the sales ratios to be more favorable. The cooperating packer and chain were apparently not sufficiently impressed to push the idea further.

Certainly pork has low prestige relative to beef. Recently I asked a sample of 150 Jefferson City households which they would probably serve a special guest at an evening meal: beef, pork, or chicken. There were 115 answers of beef, 30 of chicken, and 7 of pork.

However during the Kansas City sales test, the sales of hams soared in test stores during the very warm summer months when pork is supposed to be a drug on the market. Presumably, the combination of fresh product and adequate displays had a tremendous impact upon pork sales.

We have been exploring the possibilities of solving much of the fat problem by marketing hogs at 175 pounds or lighter. About 90 hogs ranging in slaughter weight from 125 to 175 pounds have been compared as to eating acceptability with conventional weight hogs. Except for some enthusiasm with the bacon from lighter weights, consumers response was much the same for all weights. There were a few carcass with mean ratings quite different from the mass, but in general there was surprisingly little difference in ratings.

Slaughtering hogs at lighter weights would materially increase the meat/lard ratio at the packing house and apparently would not impair the consumer acceptability of the meat. We do not have adequate data to compare the increment in costs of feeding hogs from, say, 175 to 200 pounds with the increment in cut-out value. Zobrisky has shown that fat is put on at a rapidly increasing rate as carcass weight increases, so that cut-out value increases less rapidly than weight.\(^{19}\) However, little more than feed might be charged against the last 25 pounds weight increment by many producers, so that total production costs may be computed as rising less rapidly than weight between 175 and 200 pounds. It is tempting to project the impact of lightweight hog slaughter via a slightly better feed efficiency and a considerably higher meat/lard ratio. However, research results are so preliminary as to make the projection premature.

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17/ Unpublished data, University of Missouri.
18/ I have not commented upon the results of a recent Purdue study as I do not have the details necessary to evaluate them.
To summarize, I believe as do many others that leaner pork represents an improvement in pork quality. At the same time eating preference and sales evidence is not entirely conclusive. It is possible that retail grading or branding of pork cuts will demonstrate the sales appeal of lean pork and encourage its production.

It would be a mistake to assume that such successful grading and merchandising is certain to be obtained by the first innovator who attempts it. I suspect that fat is not the only important obstacle to the consumption of pork. The Jefferson City panel ranked ham after round steak, swiss steak, charcoal steak and pot roast as usually having a delicious flavor, mentioned it most often of those 5 cuts as excluded from diet for health reasons, checked it most often as being "fattening", and ranked it fourth of the five as far as being economical. I do not foresee any total eclipse of pork, but neither can I detect any latent consumer demand which -- properly exploited -- could bring pork back to its pre-war consumption relationship with beef.

In stressing grading and quality improvement of fresh meats, I do not wish to underemphasize the importance of quality improvement via processing -- grinding, curing, etc. The 1955 Household Food Consumption Survey indicates that processed meats made up 50 percent of the weight and 46 percent of the value of all meat consumed. Ground beef, pork sausage and luncheon meats made up respectively, 13, 3, and 12 percent of total meat consumption. This strikingly large volume of ground meats testifies to the importance of a demand which has persisted in spite of varying product quality, arising from problems of freshness and occasional inclusion of excessive amounts of fat and other low value inputs. Standardization of quality could probably increase consumption considerably. Surely, entirely new products will be developed which will tickle the palate of Americans. While most ground meats require some fat for optimum palatability, the production of "wastey" cattle and hogs will not be required.

I would be expecting too much of preference research and of this preference researcher to anticipate a full-blown answer to the major question with which this seminar is concerned. Improvements in beef quality mean a movement toward leanness as soon as innovations in sorting, processing and/or breeding obtain more consistent tenderness in lean beef. Improvements in pork quality likewise mean a movement toward leanness, although major changes in processing might also provide quality improvements. In general, movements toward leanness mean higher feed efficiencies and less inputs per unit of output. On the other hand, improvements in meat quality which continue

20/ Luby has raised some interesting and plausible hypotheses concerning other obstacles. Patrick J. Luby, "Declining Demand for Pork - Reconsideration of Causes and Suggested Prescription for Remedy", JFE, December, 1958, pp. 1832-1838.
or accelerate the trend toward higher meat diets will require more agricultural inputs. The events may be expected to be slow moving and of little consequence for solving the farm income problem of 1959 or 1961.