QUALITY IDENTIFICATION AND CONTROL OF DAIRY PRODUCTS

D. D. Deane

Dairy products offered for sale must meet certain standards relative to composition, healthfulness and freedom from adulteration. There are standards, for example, established by states as a control measure over the dairy products sold within their borders. For some dairy products, federal regulations concerning definition of product, identity and wholesomeness also have been established. In addition, certain dairy products which meet basic requirements as to composition and quality standards can be classified into various grades. Inspection and grade certification of farm products based upon established quality standards have been a part of our agricultural economy for many years. Fluid milk and milk products which are included in the Grade A program are under the jurisdiction of the U. S. Public Health Service and similar agencies. The dairy division of the Agricultural Marketing Service has the responsibility for developing grade standards for butter, cheese, nonfat dry milk and other manufactured or processed dairy products. This grading service is operated on a voluntary basis and performed upon the request of an applicant. Its purpose is to provide an impartial and uniform system of inspection and grading of dairy products for use by the dairy industry, city, state or federal government or others in setting up specifications for procurement needs.

A dairy products manufacturer operates within a framework of regulations and controls that establish certain standards his products must meet relative to composition and wholesomeness. In addition, some products can be given a grade designation as an additional criterion of quality.

Grade standards, to be of greatest value, should include the full range of marketable quality and should be based on factors that can be uniformly applied. They should reflect the essential commodity characteristics to be useful to industry and users of the product. Also, with respect to manufactured dairy products, in so far as possible, they should reflect the quality of the raw milk and sanitary conditions under which they were manufactured.

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The wholesaler can buy most dairy products by grade from the processor. What about the consumer? Can he do the same? The dairy product most familiar to the consumer that is sold bearing a grade label is Grade A milk. Grade A milk is produced and processed under regulations and standards based on those established by the U. S. Public Health Service. These requirements make it easier to produce high quality raw and processed fluid milk. The producer of Grade A milk receives a higher price for his product than if it were ungraded milk since it is utilized primarily as fluid milk, whereas the ungraded milk is used in producing manufactured dairy products which yield a lower return. Grade A producers tend to increase the size of their herds over a period of time. Since approximately 50 percent of all milk produced is used for fluid milk, would this mean that as Grade A milk production in an area increased above 50 percent of the total, some Grade A milk would be utilized as manufacturing milk at a lower price? This situation has not developed to any great extent since surplus Grade A milk from one area can be trucked for considerable distances to other areas in short supply.

What about manufactured dairy products? The original grading standards for cheese were developed in the early 1920's. They have been revised slightly since then with the most recent grade standard being issued in May 1956.²/ There are four grades for cheese, namely: AA, A, B and C. Although there is no overlap of quality between grades, a certain range or latitude in quality is allowed in each grade. As one goes down the scale, the range in quality within each grade widens progressively. Four quality factors are considered in establishing the grade, and these are: flavor, body and texture color, and finish and appearance. Characteristics or defects of each quality factor are noted and classified, taking into consideration the age of the cheese. The final grade for any given cheese is established on the basis of the lowest rating of any one of the four quality characteristics. Detailed descriptions of the various grades are available for use by the graders.²/

It has been reported by Small³/ that during the period of July 1956 through June 1957 the government purchased slightly in excess of 206 million pounds of U. S. Grade A paraffined cheddar cheese. An examination of the grading data on 55 million pounds of this, representing 16 states, showed that 91 percent met the standards for Grade A cheese, 8 percent was Grade B, and only .1 percent was below grade. Six states were represented in the


summary of nearly 15 million pounds of rindless cheddar cheese offered to the government. Of this, 83 percent was Grade A, 16 percent Grade B, approximately 1 percent Grade C and less than 0.1 percent below grade. One might conclude from these figures that a relatively small amount of cheddar cheese made in the United States would not meet the quality standards for Grade A cheese. It is general knowledge in the industry, however, that a substantial amount of the cheese offered for sale to the government is screened before grading by official graders. Also, that approximately three-fourths of the cheddar cheese made in this country is not subjected to such grading, and that a significant portion of this would not meet Grade A standards. It is not too difficult to see then that work still remains to be carried out in improving cheese quality.

Butter is another dairy product for which grades have been established. The nomenclature for U. S. grades of butter, effective April, 1954, are as follows:4/

<table>
<thead>
<tr>
<th>Grade</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>U. S. Grade AA</td>
<td>93</td>
</tr>
<tr>
<td>U. S. Grade A</td>
<td>92</td>
</tr>
<tr>
<td>U. S. Grade B</td>
<td>90</td>
</tr>
<tr>
<td>U. S. Grade C</td>
<td>89</td>
</tr>
</tbody>
</table>

The quality factors in grading are flavor, body and texture, color and salt. In general, if correctly processed, sweet cream produces Grade AA or A butter, while sour, farm separated cream produces Grade B or C butter. Butter labeled as to grade can be purchased in some areas. At the present time nine states have some type of a grade labeling program for butter. Seven of these, Minnesota, Wisconsin, California, Idaho, Michigan, South Dakota and Mississippi have a mandatory grading program. Two others, Iowa and Kansas have voluntary programs wherein the manufacturer may grade label his butter if he desires, but he is not required to do so. The grades used by most of these states are based on the U.S.D.A. standards although 89 score butter is labeled "Under Grade" rather than Grade C. The Michigan law, however, states that butter scoring less than 90 score be labeled "Under Grade." No label is required for butter scoring 90 or over. These nine states produced over 67.6 percent of the nation's butter in 1957.

Those who favor grade labeling believe such a program will bring about an improvement of butter quality which will, in turn, lead to greater consumption of this product. Well, although California has had a grade labeling program for butter since 1935, Wisconsin was the first of the major

butter producing states to enact such a law -- in October 1953. In 1953, 25 percent of Wisconsin's butter was of 89 score - or "undergrade" according to their grade label. In 1958 "undergrade" butter was virtually nonexistent in Wisconsin, amounting to less than 5 percent of the state's butter production.\(^5\) Butter manufacture in Wisconsin is increasing. In 1957 they produced 42.7 percent more butter than the average for 1951-1955. A short time ago Wisconsin was third in butter production, behind Minnesota and Iowa. Now Wisconsin rates second and Iowa third.

Those favoring grade labeling emphasize four factors necessary for a successful grade labeling program.\(^5\) These are:

1. There must be a definite need for such a program.
2. The proposed program must be completely and extensively explained to all members of industry and the consumer.
3. The program must be properly administrated.
4. The program must receive full cooperation of industry.

A survey was conducted of every state department of agriculture to determine the degree of interest in grade labeling of butter.\(^6\) Not a single state department of agriculture went on record as opposing consumer grade labeling as such, although some stated they didn't believe such a law would be practical in their state at present. This latter group fell into one of two categories: (1) states in which butter was produced primarily from farm separated sour cream and this would fall into the lower grades and (2) states in which butter production is so minute that no need for such a law is recognized. There was an active interest in grade labeling of butter in Colorado, Tennessee, Nevada, North Carolina, Ohio and New York.\(^4\)

Grade labeling is not endorsed by everyone in the butter industry. The American Butter Institute has taken a stand against grade labeling calling it "unrealistic" and "inaccurate." \(^5\) This organization believes consumer grade labels have a tendency to give consumers a false sense of security because the consumer is led to believe that the grade remains unchanged from the time it leaves the manufacturer until it is used by the consumer, regard-

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less of treatment. They also point out that butter will not always be scored uniformly if graded by several inspectors. The American Butter Institute reported on a survey made of 26 samples of butter from 20 retail outlets in the Milwaukee area. 5/ These samples were regarded by U.S. D. A. graders and graders from two large butter distributors. According to the ABI the results showed wide discrepancies between the grade printed on the package and grade as determined by the U.S. D. A. and private graders. In answer to this, however, the Wisconsin Department of Agriculture stated that a study by "many authorities" of the results revealed loopholes disproving the conclusions reached by the American Butter Institute. The ABI denied this and stood by the results of its survey.

Some segments of the butter industry believe that brand labeling rather than grade labeling is the most effective way to improve quality. With brand labeling each organization would promote the use of its own brand and would control its quality factors.

The butter industry is very much aware that the per capita consumption has dropped from more than 18 pounds in the 30's to approximately 8.5 pounds at present. They also know that consumption of margarine has increased until people are now using more margarine than butter. Naturally, the butter industry would like to see butter consumption increased. When you look at other products that are highly successful in competing for the consumers' dollar, you find:

1. Product that is attractively packaged.
2. There is an effective merchandizing program to promote sales.
3. Product of uniformly good quality.

How about the butter industry? Well, they are:

1. Doing a fairly good job on packaging.
2. Doing more on promoting butter in the past few years through American Dairy Association than ever before.
3. But what has been done about quality? - Here is where those advocating grade labeling or brand labeling believe their respective programs can help.

Might it not also be helpful to determine the factors affecting consumers' choice of butter or margarine, for example, and determine if quality is one of the more important of these factors? Studies have been made to determine the importance of such factors as income, nationality, price differential,

size of family, education and age of homemaker on choice and consumption of fats and oils.

A study in Minnesota\textsuperscript{7} showed that in 1952 more than one-third of the families interviewed used margarine, although at that time butter was the predominant spread used. About 60 percent of the families used butter alone, 10 percent consumed only margarine and 30 percent used both. This study indicated that income, nationality and size of family influenced the relative consumption of butter and margarine the greatest, with family income the most important of all. As family income increased, the consumption of butter increased and that of margarine decreased. The total fat consumption remained nearly the same for all income levels. The price of butter was considered the most important factor in the increase of margarine consumption. Also, price differential between two products was important.

Surveys made of Michigan families in 1949 and 1954 showed different results.\textsuperscript{8} In 1949, 59 percent of families used only butter, 20 percent used only margarine and the remaining 21 percent used both. In 1954, only 38 percent used butter alone, 29 percent only margarine and 31 percent used both. In 1949, 83 percent of those not using butter said it was too expensive; in 1954, 59 percent of those not using butter gave the same reason. In 1949, 11 percent of the families had no preference for butter over margarine. In 1954, 33 percent had no preference. Taste was the main reason given for using butter rather than margarine.

A consumer panel study, comprising 40 families, was carried out in South Dakota in an attempt to determine whether the U.S.D.A. grading system for grading butter agreed with the preference of the consumer.\textsuperscript{9} The butter samples used were manufactured, graded and coded by the Dairy Department of South Dakota State College. Half the Grade A butter was made with starter culture to accentuate the desired aroma and flavor of the butter. Besides Grade A butter made with and without culture, the study also included Grades B and C butter and margarine. Two adults, usually husband and wife, were asked to compare and rank two half-pound samples of butter or margarine.

\textsuperscript{7} Cox, Rex W. "Competition Between Butter and Margarine, Minneapolis, 1952." Minn. Agriculture Experiment Station Bulletin, 417. 1953.


The samples were identified only by code. Every family received the four samples of butter and one sample of margarine in all possible combinations over a 10-week period.

The findings of the survey indicated that these 40 families preferred a high quality butter with flavor and aroma found in cultured Grade A butter, followed by Grade A butter without culture, Grade B and Grade C butter with margarine last. It should be mentioned that the butter grader, and several panel members felt the quality of the margarine samples was below average.

A survey was conducted in Oklahoma with 216 households on consumer preference for butter or margarine. Both urban and farm families were studied. From the standpoint of flavor the urban consumers preferred Grade A butter, followed by AA, B and margarine, while the Grade C butter was last. These consumers felt that Grade A butter had more flavor than Grade AA. Those living on farms ranked AA butter first and Grade A butter second. However, when these products were ranked as to preference on the basis of spreadability due to body and texture, margarine was ranked first followed by Grade A, AA, B and C butter. Butter was preferred over margarine on the basis of such quality factors as taste, cooking qualities, appearance and what was expressed as a higher food value. Margarine was preferred on basis of uniformity and spreadability. Price also was a factor in determining which table spread was used. Where customers were asked if they would use more butter if butter was the same price as margarine, 72 percent said yes and 23 percent answered no. When asked if they would use less margarine if it sold at the same price as butter, 65 percent said yes, but 31 percent said they would still buy margarine. This, to the butter manufacturers, is a disturbingly large number that would pay such a high price for margarine. Evidently, to some, the spreadability and uniformity of product are important quality attributes. An attempt was made to determine what was considered a fair price for butter of the quality found in Oklahoma at that time. The survey showed that butter sold at 46 cents per pound would be considered a good buy by 50 percent of those interviewed.

There are those, however, who make a high quality product and sell it at premium prices. One example is a plant at Ladysmith, Wisconsin. Since the Grade AA butter found on the market usually has a rather flat flavor, they make Grade AA cultured butter. All their butter is sold to the retail trade in some 22 states. They found the average consumption of this butter in 100 families in the south was 52 pounds per person. A survey conducted among Wisconsin consumers of their butter showed an annual


per capita consumption of more than 52 pounds. This would seem to strengthen the belief of those who believe that while inferior butter has a competitor, margarine, high quality butter with a flavor the consumer likes has no competitor.

A recent American Dairy Association survey, however, points to prestige as the housewives' most powerful motivation to serve butter. H. C. Christians, of Chicago, a large butter wholesaler, believes if this is what the housewife wants she should be able to get it. They believe, too, that the flavor of most high quality butter sold today is too bland. Also, that butter labors under a pricing structure tied to a fluctuating national market. This structure accents low profit margins that do not permit energetic promotion of butter. One million dollars was spent in 1958 promoting butter; 18 million were spent on margarine. H. C. Christian, therefore, has based their new program to sell more butter on what they call the 4 P's.

1. **New Product.** Made from sweet cream, cultured to provide "deep-bodied, farm churned flavor." Has improved spreadability. To be called "Pride" butter.

2. **New Package.** Use double foil packaging with a design of an old fashioned churn on carton, wrapper and embossed on quarters of butter themselves - a carry-through of prestige identity.

3. **Promotion.** National distribution and handled exclusively by home delivery dairies - backed by money back guarantee. There is an introductory offer of one free pound of butter provided the customer agrees to buy four pounds at regular price within next thirty days. Also a customer booklet introducing and describing the product.

4. **Price.** Product is priced at 71 cents to dairy and suggested retail price is 84 cents except on west coast--(86 cents).

This program is just getting started. I am sure it will be watched with interest by the butter industry.

These two examples illustrate one approach to the problem of increasing the demand for dairy products. That is to produce and manufacture dairy products of high quality. Of the quality factors used in grading dairy products, the one assigned the greatest value by those responsible for grade standards is that of flavor. I think all would agree that flavor plays a very important role in milk consumption. Those who drink milk do so because they like it. Parents admonish their children to drink milk for reasons of health, in other words because "It's good for you". Actually the average young person doesn't concern himself too much with the problem of health. He drinks milk because he likes it as a beverage; it tastes good.

Today the entire food industry is taste and flavor conscious and makes use of taste panels in its attempts to achieve and maintain superiority of flavor.
The dairy industry, too, is forced to place more emphasis upon the flavor of its products in order to meet competition of other foods. It also is important with respect to competition within the dairy industry itself. Consumers are often enticed to a certain brand of dairy products because of the superiority, to them, of some organoleptic quality. The dairy industry certainly cannot afford to ignore or minimize the importance of flavor in dairy products.

Improved facilities for production, handling and transportation of milk and better processing methods make possible the marketing of milk products of excellent quality. We have mentioned the importance of flavor; there are other quality factors perhaps not as easily observed by the consumer. The milk must be clean, free of adulteration and pathogenic organisms. It should have a low bacteria count. If consumers can buy a wholesome, nutritious, reasonably priced product with a consistently good flavor, they are likely to be satisfied consumers.

These quality characteristics, of course, do not just happen. They are a result of supervision of the product from the time it leaves the cow until it reaches the consumers' table. In other words, a result of quality control. There are at least three, and sometimes four, groups involved in the control of quality of dairy products. Let us briefly consider the responsibilities of each group.

First, the producer. Milk has been called nature's most perfect food. As it come from a healthy cow, this is no doubt true. It is wholesome, clean, fresh and good. This is the point where its true quality must be measured. We can protect and prolong the life span of this intrinsic quality. We can even eliminate certain undesirable flavors, but we can't really improve the quality itself. It is obvious then that if we are to market a high quality finished product, we must have a high quality raw product. This is the role and the responsibility of the milk producer - to make available a high quality raw product. To do this he should have:

1. Disease free animals.
2. Good water supply free from contamination.
3. Milk house and milking barns or parlors of proper design and properly equipped for taking care of milk, including cooling.
4. Employees free of communicable disease.

There is another factor. He must be genuinely interested in producing high quality milk. One fact that helps achieve a motivation toward the goal of high quality milk is that there is a direct correlation between the quality of the milk and its monetary value to the processor.
The milk producer, of course, does not have all responsibility for the quality of dairy products. The processor also plays an important role.

A well-organized, efficient and aggressive processing plant will have an effective quality control program and a well-equipped laboratory. The equipment need not be elaborate, but it must be adequate to do the job efficiently. The laboratory must be staffed, too, by someone trained in this field. One aspect of a quality control program is to carry out a program of quality control on the producers' farms through a farm inspection and education program. To do this effectively a well-educated and well-trained fieldman is necessary. The fieldman serves as a liaison agent between processor and producer. He helps producers solve problems that arise in their efforts to produce quality milk. The fieldman can explain results of laboratory tests carried out by the quality control laboratory. The fieldman must be competent, fair and a good diplomat if he is to gain respect of the producer. He must gain the respect of the producer to be effective.

Once the milk is brought to the processing plant, quality control becomes the responsibility of the processor. In brief, laboratory tests must be made on both the raw and finished product every day. Routine checks should be run daily on the operation and performance of all plant equipment. Cleanliness and sanitization of the equipment is checked periodically to prevent a build up of milkstone and other contamination. It has been estimated that one-third of the labor involved in processing and packaging milk and other dairy products is devoted to cleaning and sanitizing the equipment and premises. The processing plant, through its quality control program, attempts to insure that it is selling dairy products that meet the high standards required if they are to find a market. From this point on, the retail stores, if involved, and the consumer can, by their actions, help maintain this high quality or bring about deterioration. Milk, if it is to be held, must be held at a temperature below 40°F. if bacterial growth is to be restricted. If in a clear glass bottle it should be kept out of as much direct light as possible. In the store the milk and other dairy products should be kept in a separate dairy case. At home, care should be taken to keep the containers closed. The average home refrigerator contains a strange and wonderful collection of foods each with its particular odor, and milk and other dairy products have the ability to pick up alien odors - odors not necessarily bad until they get into the milk. All too often the producer or processor is believed responsible for deterioration of milk quality that occurred in the retail store or in the home itself. The proper care of milk in the retail store or home is not a demanding task. On the contrary, it is merely the application of common sense procedures in a routine fashion. But, like the products it involves, the dividends are far in excess of the cost.

To briefly summarize then, quality control is the responsibility of not only the producer and processor, but also the retailer and the consumer. The realization of this by those concerned is important since many in the dairy
industry believe that with the aid of more effective quality control, dairy products of higher quality and greater consumer appeal can be produced. Any resulting increase in consumption should be beneficial to both producer and processor and a uniform high quality would be a consumer benefit as well.

I have mentioned some of the factors affecting consumer acceptance or preference in dairy products. They vary to some extent with the product concerned.

Such things as nationality, diet habits, product familiarity, family size and age distribution are affecting consumer preference. Price or price differentials affect consumer choice of product, such as choosing between butter and margarine. The quality characteristics of the products themselves are very important. These include body and texture characteristics, color and appearance. Uniformity of product is essential. The quality characteristic I believe most important in all dairy products is flavor. The dairy industry of today cannot minimize the importance of flavor in their attempts to increase consumer demand for dairy product. Someone has said, "flavor is the voice of food." Flavor should be such that the voice is pleasing and uniformly so from day to day. People may be told a great many times of the high nutritive value of dairy products but unless they have what might be termed an excellent eating quality consumer demand will not reach its full potential.