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THE FINANCIAL STIMULUS IN CITY MILK PRODUCTION.

H. A. HARDING AND J. D. BREW.



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THE FINANCIAL STIMULUS IN CITY MILK PRODUCTION.

H. A. HARDING AND J. D. BREW.

SUMMARY.

1. Under present financial conditions the wholesale price of city milk is not high enough to yield the average owner of a dairy a satisfactory interest upon his investment. Therefore he is compelled to supply the cheapest grade of milk that the market will accept without reducing the purchase price.

2. The main opportunity for cheapening production is to omit the labor and care which are necessary to the production of a clean sanitary article.

3. The financial stimulus is the strongest force which can be enlisted in the improvement of municipal milk supplies. Milk supplies will never become better as long as the largest profit is attained by the production of dirty milk. However, they will improve when consumers are able to buy graded milk which they are sure is true to grade.

INTRODUCTION.

Bulletin No. 337¹ of this Station gives the record from September, 1907, to March, 1911, of the changes in sanitary quality of the milk supply of a city of 13,000 people as supplied by 550 cows distributed among 40 dairies. The object of that publication was to call attention to publicity and payment based on quality as potent factors in the improvement of city milk supplies.

In that study the quality of the milk was estimated by scoring the dairies according to the Cornell Dairy Score Card devised by Dr. R. A. Pearson. The facts regarding the individual dairies were ascertained by the city sanitary inspector and the scores were apportioned by one of the authors (H) of this article.

¹ Publicity and payment based on quality as factors in improving a city milk supply. H. A. Harding, N. Y. Agr. Exp. Sta. Bul. 337. 1911.

In this former study the two factors, publicity and the financial stimulus, were so closely united that it was not possible to estimate accurately their relative importance.

As the result of changes in conditions, for which the authors are in no way responsible, it is now possible to observe the results from removing the financial stimulus to the production of cleaner milk while practically every other element in the situation remains unchanged. This publication is designed to show the results of the removal of this stimulus as measured by the sanitary conditions surrounding the production of the milk supply.

It is generally recognized that the scores given to a dairy by two inspectors will vary somewhat even when scoring according to the same card. Accordingly, before making any deductions from the present and former scores it is well to consider whether they are comparable.

The method of arriving at the scores in the former publication has already been given. In the present statement the facts regarding the dairy conditions have been obtained by one of us (B) and the rating of these conditions has been fixed by the other one (H). It is true that the facts regarding the lapse of time since the last tuberculin test, the prevalence of cobwebs and litter in the stables, the number of cows which were incrustated with their own dried excrement, the temperature to which the milk was cooled and similar information were collected by two different individuals. However, since these are questions of fact which can be readily and quite accurately determined, there is no reason to think that these observations by the two men differed in any important particular. Since the valuations of these facts were made by the same individual in both cases, using the same standard of cuts for undesirable conditions, it seems safe to conclude that the two sets of scorings are fairly comparable.

Accordingly, the contrast between the actual conditions of milk production where the financial stimulus toward cleaner milk production was present and where it was absent is offered as a contribution toward the solution of the vexed question of better city milk supplies.

BASIS OF SCORING.

The score card which has been used throughout the entire study of this milk supply and upon which the contracts between the producers and the retailers were based is the one devised by Dr. R. A. Pearson while he was at the head of the dairy department in Cornell University and is known as the Cornell University Dairy Score Card. The front and the back of this score card are shown on the following two pages.

CITY OF.....

Score Card for Production of Sanitary Milk.

Date..... Dairy of..... P. O.

Retailed by.....

		Perfect.	Score.	Cuts.
1. HEALTH OF THE HERD AND ITS PROTECTION.	Health and comfort of the cows and their isolation when sick or at calving time..	45		.....
	Location, lighting and ventilation of the stable.....	35		.....
	Food and water.....	20		.....
	Total.....	100		
2. CLEANLINESS OF THE COWS AND THEIR SURROUNDINGS.	Cows.....	30		.....
	Stable.....	20		.....
	Barnyard and pasture.....	20		.....
	Stable air (freedom from dust and odors).....	30		.....
	Total.....	100		
3. CONSTRUCTION AND CARE OF UTENSILS.	Construction of utensils and their cleaning and sterilizing.....	40		.....
	Water supply for cleaning and location and protection of its source.....	25		.....
	Care of utensils after cleaning.....	20		.....
	Use of small-top milking pail.....	15		.....
	Total.....	100		
4. HEALTH OF EMPLOYEES AND MANNER OF MILKING.	Health of employees.....	45		.....
	Clean over-all milking suits and milking with clean, dry hands.....	30		.....
	Quiet milking, attention to cleanliness of the udder.....	25		.....
	Total.....	100		
5. HANDLING THE MILK.	Prompt and efficient cooling.....	35		.....
	Handling milk in a sanitary room and holding it at a low temperature.....	35		.....
	Protection during transportation to market.....	30		.....
	Total.....	100		
	TOTAL OF ALL SCORES.....	500		

If the total of all scores is..... And each division is..... The sanitary conditions are.....

480 or above..... 90 or above..... EXCELLENT.

450 or above..... 80 or above..... GOOD.

400 or above..... 60 or above..... MEDIUM.

Below 400..... Or any division is below 60..... POOR.

The sanitary conditions are..... Scored by.....

A BRIEF DESCRIPTION OF WHAT CONSTITUTES PERFECT UNDER EACH HEADING.

1. **HEALTH.** No evidence of chronic or infectious disease or of acute disease in any member of the herd on the dairy premises. Freedom from tuberculosis proven by the tuberculin test made within one year.
COMFORT. Protection from weather extremes. Stall comfortable,— at least 3' wide for a small cow, or 3½' for a large cow; length of stall sufficient for cow to rest easily. Sufficient bedding. Frequent out-door exercise.
ISOLATION. Removal of cows to comfortable quarters outside of the dairy stable, when sick or at calving time.
LOCATION OF STABLE. Elevated, with healthful surroundings.
LIGHTING. As light as a well lighted living room, and with not less than four square feet for light from the east, south or west, for each cow.
VENTILATION. An adequate ventilating system of the King or other approved pattern, and, except when the stable is being cleaned, no marked stable odor.
FOOD. Clean, wholesome feeding stuffs, fed in proper quantities.
WATER. Clean, fresh water, free from possibility of contamination by disease germs.
2. **COWS.** Cleaned by thorough brushing, and where necessary by washing; no dust nor dirt on the hair (stains not considered). The udder thoroughly cleaned by brushing at least thirty minutes before milking, and by washing just before milking, leaving the udder damp to cause dust to adhere.
STABLE. Free from accumulation of dust and dirt except fresh manure in the gutter. Apart from horses, pigs, privy, poultry-house, etc.
BARNYARD AND PASTURE. No injurious plants, no mudhole nor pile of manure or any decaying substance where cows have access.
STABLE AIR. Free from floating dust and odors. Tight partitions or floor between the space occupied by cows and that used for storage of feed or other purpose.
3. **CONSTRUCTION OF UTENSILS.** Non-absorbent matter and every part accessible to the brush, and, except inside of tubes, visible when being cleaned.
CLEANING. Thorough cleaning with brush and hot water, and rinsing. No laundry soap. Thorough sterilizing.
WATER. From a source known to be pure; protected from contamination from seepage, or surface drainage.
CARE OF UTENSILS. Such as to avoid contamination by dust as well as coarser dirt.
SMALL-TOP PAIL. With opening not over seven inches in diameter, and at least one-third of this opening protected by hood.
4. **EMPLOYEES.** Free from contagious disease and not dwelling in or frequenting any place where contagious disease exists.
MILKING SUITS. Freshly laundered and clean; ample to protect from dust and dirt, from the milker's person or clothing.
MILKER'S HANDS. Hands and teats dry when milking. Hands thoroughly cleaned before milking each cow.
5. **COOLING.** Cooled within fifteen minutes of milking, to temperature below 50 degrees F.
HANDLING. In a room used exclusively for handling milk, and free from dust, dirt and odors; and the milk after being cooled, always at a temperature below 50 degrees.
PROTECTION DURING TRANSPORTATION. Protected from dirt by tightly closed receptacles, temperature always below 45 degrees F.; not delayed in transit, reaching market within twenty-six hours after milking.

The facts regarding the dairy conditions were determined by one or more visits of the inspector to the dairy at milking time supplemented by occasional tests of the temperature of the milk when delivered to the retailer. In reducing the conditions as found

to a numerical basis a dairy was credited as perfect in each particular unless some objectionable condition or practice was found. Cuts or deductions from the perfect score were made in accordance with the following schedule, the aim being to make identical cuts for similar conditions:

SCORE CARD CUTS USED.*

HEALTH OF HERD AND ITS PROTECTION.

- No tuberculin test, 12.
- Old tuberculin test (over one year), 12.
- Rigid stanchions (not cut when cows were confined only during milking, as in summer), 3.
- Light, 1 to 5, according to conditions.
- No special system of ventilation, 2.
- Ventilation, 1 to 5.
- No comfortable provision for isolation or calving outside of stable containing milking cows, 5.
- Stable poorly built to protect from the weather, 1 to 5.

CLEANLINESS OF COWS AND THEIR SURROUNDINGS.

- Manure or dust on cows, 1 to 10.
- Hair about udders not clipped, 1.
- Damp cloth not used on udders before milking, 2.
- Litter or roughage on stable floor, 1 to 5.
- Ceiling not tight, 1 to 5.
- Cobwebs and dust in stable, 1 to 5.
- Stable not whitewashed within one year, 5.
- Horse in cow stable, 5.
- Manure not removed once per day, 1 to 10.
- Manure or mud in barnyard to which cows have access, 1 to 10.
- Feeding dry feed just before milking, 1 to 10.
- Objectionable odors in stable, 1 to 5.

CONSTRUCTION AND CARE OF UTENSILS.

- Insufficient cleaning, 1 to 5.
- No special sterilization (no steam), 5.
- No small-topped pail, 15.

HEALTH OF EMPLOYEES AND MANNER OF MILKING.

- No special clean milking suits, 5.
- Dirty suits, 1 to 5.
- Milking with wet hands, 10.
- Unclean hands, 1 to 6.

HANDLING THE MILK.

- Not efficiently cooled (59° F. or below).
 - 50° to 60°, cut 5.
 - 61° to 70°, 10.
 - above 71°, 15.
- Not held at 50° F. or below, 5.
- Milk strained in stable, 5.
- Milk room not clean, 1 to 5.
- No milk room, 3.

* These were the cuts as applied to actual conditions. More unsanitary surroundings would merit greater cuts than those indicated.

SUMMARY OF PAST CONDITIONS.

In order to make the results of the study of sanitary conditions surrounding the production of milk in this city more easily understood the inspection findings were grouped as indicated on the score card (page 167) under the following headings: Poor, including filthy conditions; medium, where conditions were merely dirty; good, where conditions were fairly clean; excellent, where they were both clean and sanitary.

A careful initial inspection in 1907 showed that 5 per ct. of the dairies were "good," 57.5 per ct. "medium" and 37.5 per ct. "poor." The influence of publicity was immediately brought to bear on the situation. Gradually the milk producers and retailers became convinced of the accuracy and usefulness of the official scores, with the result that by the beginning of 1911 practically all of the milk was being sold by the producers to the retailers on sliding-scale contracts. These contracts stipulated that the milk must be produced and delivered in accordance with the requirements of the board of health and that the price for each quarter should be based upon the official score given the producer by the board of health, no milk to be accepted when below the grade of medium and the price to increase one-half cent per quart with each grade above. The economic force which made profitable the payment of this bonus for better grades of milk was the publicity given by the board of health to the sanitary conditions present in each dairy as well as the name of the person or firm retailing the milk in the city. Under such conditions each retailer found it financially profitable to stimulate the production of cleaner milk because of the influence of the official report upon the public demand for his goods.

Under the joint action of these two factors, publicity and payment based on quality, the sanitary conditions surrounding the milk supply steadily improved until the report for March, 1911, showed that 12.8 per ct. of the dairies ranked as "excellent" and 87.2 per ct. "good." The "poor" grade had disappeared quickly before the light of publicity and the "medium" grade had decreased steadily and finally had disappeared.

Thus, by the observance of the simplest economic laws, an exceptionally satisfactory milk supply was provided at a cost to the municipality of \$500 per year for the additional salary of the sanitary inspector. It should be noted, however, that the vital point in this plan was the voluntary acceptance by all parties of the official scores of the dairies as a satisfactory basis for doing business.

FINANCIAL MAGNITUDE OF THE MILK BUSINESS.

In response to the general public demand for better milk supplies attempts at improvement have been made in practically all of the larger, and in many of the smaller, cities. Too frequently these

attempts have not taken into consideration the financial magnitude of the business interests which they have undertaken to control. Neither have they questioned whether their efforts were in accord with or opposed to the economic laws which apply to the milk business.

This lack of familiarity with the financial side of the milk business on the part of milk reformers is partly due to the fact that but a small part of the investment is apparent to them and largely because detailed information on this phase of the subject has not been brought to their attention.

In the present instance nothing approximating a census has been attempted, but personal estimates regarding the financial magnitude of the various items have been kindly furnished by several persons most familiar with local conditions. These estimates have been carefully weighed and figures selected which, while they are believed to represent the facts fairly, are considered distinctly conservative. These figures, together with an estimate of their relative accuracy are as follows: Stimulated by the increased demand for milk, the dairies have been increased to 41 and the number of cows to almost exactly 600. This number varies slightly on account of the buying and selling which are constantly occurring among the various dairies, but the error at any given time will probably be less than 3 per ct. The average value of the animals is more uncertain. About one-third of these cows have changed hands recently at prices averaging above \$110 each, but it is undoubtedly true that these are the better cows. Estimates of average value have ranged from \$65 to \$100. Somewhat detailed estimates on the basis of known values of a considerable number of the herds indicate that an average value of \$80 is probably accurate.

It is a matter of practically unanimous agreement that in this region a well balanced dairy farm must devote five acres to each cow. This leads to the conclusion that 3,000 acres of land are required in order to support the 600 cows. The value of this land is again a variable factor. Much of it lies within a few miles of the city and is held at \$100 to \$150 per acre. A few of the farms are less favorably located. An estimate of \$100 per acre is considered conservative.

• In order to support the cows the farms must be equipped. Aside from the buildings, the value of which is included with the land the most expensive single item of equipment is horses. Since the average dairy would contain 15 cows and the farm 75 acres the estimate of equipment has been based on the results of known auction sales of similar farms supplemented by known expense of equipment on a few farms. The estimate of \$1,500 per farm or \$20 per acre for equipment in addition to the buildings and cows errs on the side of being too low.

The capital invested in the city distributing end of the business is in connection with two large milk companies and two distributors

of the product from single dairies. Estimates from various sources differ slightly but \$50,000 appears to be conservative.

These detailed estimates are assembled below:

CAPITAL INVESTED IN SUPPLYING MILK TO CITY WITH 13,000 INHABITANTS.

Cows — 600 at \$80.....	\$48,000
Land with buildings — 3,000 acres at \$100.....	300,000
Equipment — 3,000 acres at \$20 per acre.....	60,000
City distributors.....	50,000
Total.....	<u>\$458,000</u>

Because of the magnitude of these totals and of the fact that they are based upon estimates many will feel that they are too high. Appreciating this fact the above conservative estimates were accepted notwithstanding the conviction of the authors that were complete information available the grand total would be at least 10 per ct. higher.

The State Department of Health bases its mortality statistics for this city on an estimated population of 12,574. Using this figure for the population, the above estimate of dairy capitalization amounts to \$36.42 per capita of the people being supplied with milk. Considered from the agricultural standpoint the capitalization amounts to \$763 per cow of which the producer furnishes \$680 and the retailer \$83.

MARGIN OF PROFIT.

The margin of profit of the individual producer can not be accurately calculated without exact information regarding capital invested, expense of operation and returns. On the other hand the average financial returns from the business as a whole can be calculated from more general data and are even more instructive when considering the workings of a plan for milk improvement. The following financial analysis indicates how narrow is the margin of average profit. It is this meagerness of financial return which makes the dairy business respond so quickly to any opportunity for increased gain.

The income from these dairies is practically confined to the sale of milk and some calves for veal and the accumulation of fertilizer. The value of the fertilizer and of the veal is difficult to determine. The amount of milk produced per cow may be estimated from the yearly receipts of the two large retailers. While the number of cows in the dairies varies somewhat during the year the receipts of these retailers indicate that the annual production is approximately 2,800 quarts per cow. This is markedly more than the average annual production for the State, which has been estimated² at 4,500 lbs., or 2,100 quarts. However, a high production is to

² The individual animal as the unit in profitable dairying. G. A. Smith, N. Y. Agr. Exp. Sta. Bul. 322. 1910.

be expected here from the fact that many of the herds are composed of carefully selected, high-priced animals.

The producers have been receiving 3.5 to 4 cents per quart for their milk delivered to the retailer, the variation depending upon the sanitary conditions surrounding its production. The careful records of a herd³ producing almost exactly 2,800 quarts per cow show that the cost of the food consumed by such cows has been steadily increasing and in 1908 amounted to 2.09 cents per quart of milk produced. Inasmuch as the producer has an investment of \$680 per cow, if he is to receive 6 per ct. on his investment, he should get \$40.80 per year or 1.45 cents per quart to pay this interest on his investment. Since the food cost amounts to 2.09 cents and the interest on the investment to 1.45 cents per quart the sum of these, or 3.54 cents, must be deducted from the wholesale price of the milk in determining the balance left to pay the other expenses of operation of the dairy and of delivery of the milk to the retailer.

On the basis of the above figures it is plain that the producer who is selling his milk at 3.5 cents per quart is getting slightly less than the value of the fertilizer and veal to offset his expense for labor and supervision. On the same basis the producer selling at 4 cents per quart has a margin of 0.45 cents per quart in addition to the fertilizer and veal to balance his running expenses. It should be noted in this connection that this latter class of producers have gone to extra expense in keeping their herds tuberculin tested and in otherwise improving their sanitary conditions and this entails an added expense which will consume a considerable portion of the increased margin of profit.

The financial situation of the average producer may be summarized by saying that he spends his time in growing crops to make milk to get fertilizer to grow more crops to make more milk to get more fertilizer. He continues in business because he accepts less than 6 per ct. upon his capital invested. His financial salvation depends upon increasing the productivity of his land to the point where it takes less than five acres to support a cow and increasing the productivity of his cows so that they will produce more than 2,800 quarts per year. A part of the solution of his difficulties lies in the possibility of an increased wholesale price for his product.

The financial margins of the retailer are less clearly understood. He is dealing in a very perishable product, he has a source of supply which varies greatly in volume during the year and is supplying a market which is subject to daily and monthly variations in demand. He is disposing of his goods in small amounts, pints and quarts, and the containers are fragile and expensive. Moreover, he is being put to an increasing expense in the matter of machinery and of supervision and he is being constantly hedged about by legal restrictions. Finally his relative expenses of operation vary greatly with the volume of business. Detailed statements recently fur-

³ See footnote 2.

nished by one of the large retailers of Boston⁴ indicate that in their large business their expenses for handling milk amounted to 4.77 cents per quart. In this smaller city where some of the expense items are smaller the margin between the 3.75 cents per quart which goes to the producer and the 7 cents paid by the consumer is only 3.25 cents per quart. It is therefore evident that the business here must be even more economically conducted than in the city of Boston. The fact that the largest retailing company, which has been in business eight years, has never paid over 7 per ct. on its stock indicates that the margin of profit is not very wide.

Under the contracts between the producer and the retailer, as already explained, the wholesale price increased one-half cent per quart from the medium to the good or from the good to the excellent grades. From the preceding analysis it is plain that a decrease of one-half cent per quart in the wholesale price would practically wipe out the margin of profit in milk production.

While it is true that not every objectionable practice would merit a cut sufficient to change the classification of the milk, such would frequently be the case and in some instances a change of two grades might result from a combination of unsanitary practices.

Under such circumstances the power of the inspector to enforce good sanitary conditions surrounding a milk supply is very great and practically its only limit is the readiness with which the milk men can refuse to abide by his action if the inspector abuses his power and forfeits their respect.

The potency of this power when rightly used is seen in the remarkable way in which the sanitary conditions surrounding this milk supply improved during the period between 1907 and 1911.

MILK SUPPLY SITUATION CHANGED.

APPOINTMENT OF DAIRY INSPECTORS.

Under conditions as here outlined where the dairy inspector was virtually the financial arbitrator in a business capitalized at \$458,000 it is vital to the success of any plan for milk improvement that he be a man qualified for the important duties which he is to perform.

In all cities in this State it is necessary to make appointments from lists furnished by the local civil service commissions. There is frequently considerable difficulty in getting these commissions to appreciate the technical character of the requirements for dairy inspectors. In Bulletin 337⁵ are given in detail the circumstances leading up to the appointment of the first dairy inspector, a railroad baggage-master whose agricultural experience was restricted to his boyhood on a fruit farm. In that instance he was trained by a member of the board of health and by attendance at the Short

⁴ H. P. Hood & Sons. Cost of delivering a quart of milk to the consumer. *Hoard's Dairyman*. 41 : 859. Ju. 19, 1912.

⁵ See footnote 1.

Course in Agriculture at Cornell University with the result that he eventually became an efficient inspector.

Early in 1911 the member referred to above withdrew from the board of health and later in the year the dairy inspector resigned to enter the postal service.

The vacancy in the position of dairy inspector has since been twice filled by the board of health from eligible lists furnished by the Civil Service Commission. Neither of these inspectors has had anything which could reasonably be considered as a preparation for the technical work of sanitary scoring of dairies.

The character of these appointments and the results upon the milk situation which followed them indicate clearly that there must be a radical change in the prevailing point of view regarding the qualifications for municipal appointments before we shall have a public service which will command the respect and cooperation of the milk producers and retailers. Without such respect and co-operation practically nothing can be accomplished.

REACTION OF THE INSPECTION UPON THE CONDITIONS OF PRODUCTION.

The position of an untrained inspector, made responsible for dairy scoring when the financial importance of his scoring is so great, was not an enviable one. His main source of guidance was the detailed scores of the dairies as they had been given by his predecessor. It was a natural assumption that these scores were fairly correct measures of the existing conditions. Under such circumstances fine distinctions were impossible and it was the natural tendency to repeat the gradings previously given.

The results of the inspections as given by the quarterly reports of the board of health indicated that the sanitary conditions surrounding the production of the milk supply had remained practically unchanged, the report for Dec. 31, 1912, showing 10 per ct. of the dairies as "excellent" and 90 per ct. as "good." These reports were gratifying to the public since they indicated the continuance of satisfactory sanitary conditions and they were satisfactory to the producers since they insured the continuance of the prevailing prices for milk.

The authors have been engaged for some time on a comparative study of various dairy score cards. In August, 1912, they were being aided in this study by Mr. F. H. Bothell, of the Dairy Division of U. S. Department of Agriculture, a man of wide experience in the sanitary scoring of dairies. In company with Mr. Bothell and Mr. G. A. Smith, Dairy Expert at this Station they inspected 15 of the dairies supplying this city in connection with these score card studies. At this time it was evident that, notwithstanding the favorable reports given by the city inspector, the sanitary conditions surrounding the milk production had deteriorated very markedly.

The conditions were again determined by an inspection of the dairies by one of us (B) during the last quarter of 1912, and all of the dairies were again visited during January and February of 1913. In each case the facts as they existed were noted at the time of the visit and the reduction of this to a numerical score was supervised by the other author (H). Using the same standard of cuts and

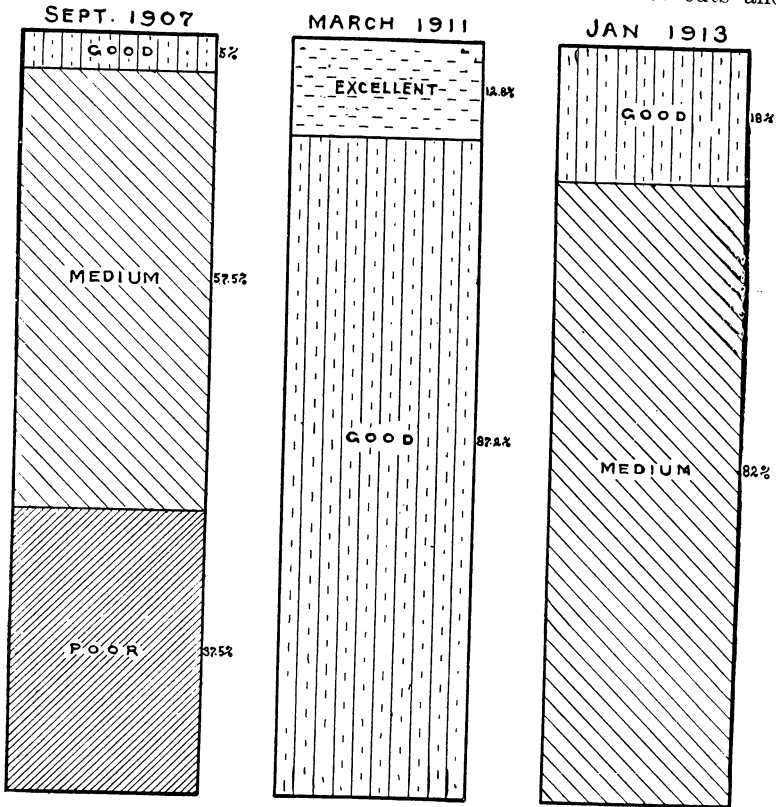


FIG. 1.— CHANGE IN SANITARY QUALITY OF CITY MILK SUPPLY.

making the scorings in all particulars as comparable as possible with the scoring made in March, 1911, when the results were 12.8 per ct. "excellent" and 87.2 per ct. "good," the inspections made in January and February, 1913, gave 18 per ct. "good" and 82 per ct. "medium."

The magnitude of this change in conditions is shown graphically in Fig. 1.

The nature of these changes in sanitary conditions is extremely suggestive. In a number of cases the tuberculin test was not renewed within the year and the reacting animals removed; the cleaning of the cows was generally omitted and in some cases their bodies were allowed to become well coated with dried excrement; frequently little or no attention was given to the cooling of the milk; cobwebs, dust and general litter accumulated in the stables; the barnyards often became choked and muddy from the accumulation of manure. It should be noted that the failure to attend to these details saved money or saved labor, which, under present conditions, amounts to the same thing to the producer. It should also be noted that with the exception of the tuberculin test there was no single day when any one of the above conditions could have been said to have changed from good to bad. The resulting bad conditions were the cumulative result of a gradual lowering of the standard of doing business.

REASON FOR THIS CHANGE IN SANITARY CONDITIONS.

In attempting to locate the cause for this marked deterioration in sanitary conditions it should be remembered that not a letter of the city milk ordinances has been changed, that the form of milk inspection has been continued, that the milk is still sold by the producer to the retailer under the same form of contract which was in force when advancement was most rapid. In short, every external form and legal enactment which accompanied one of the most striking recorded cases of municipal improvement of a milk supply is still in force and yet within less than two years the sanitary conditions surrounding the milk production have returned essentially to the condition in which they were at the beginning of the original improvement.

Under the sliding scale contracts as explained on page 170 the wholesale price of milk increased one-half cent per quart in passing from "medium" to "good" or from "good" to "excellent." As explained in Bulletin 337 the increased expense connected with bringing a dairy ranking as "medium" into the "good" class was ordinarily confined to that of the labor connected with keeping the cows and their surroundings cleaner and in cooling the milk. As the production of "medium" milk at 3 cents per quart was financially unprofitable and the expense attending the change to the "good" grade amounted to less than one-half cent per quart the dairies all came up to the "good" grade. In bringing the dairy up to the "excellent" grade the farmer not only incurred an increased expense for cleanliness and cooling of his milk but also faced the problem of maintaining a herd which would pass the tuberculin test. The extent of loss in connection with reacting animals was so uncertain that the majority of the farmers hesitated to take the chance even with a margin of one-half cent per quart. So far

as information is available all those who took the chance found it financially profitable.

The situation which existed during 1911 may be summarized by saying that the farmers produced fairly sanitary milk because it was the quality which they could produce most profitably.

Under conditions which existed during the latter part of 1912, when the official grading of the dairies merely retained them at the highest grade which they had previously reached, the financial stimulus for the production of cleaner milk was weakened if not entirely removed. Although the farmers exercised progressively less care in the production of milk they suffered no financial penalty. While the retailers were aware that the sanitary quality of the product as furnished them was deteriorating they could make no effectual protest since they were bound by their contracts to accept the official score as the basis for payments.

CONCLUSIONS.

The former system of wholesale prices according to which milk was bought by weight or measure regardless of its commercial quality practically compelled the production of the cheapest and dirtiest possible supply.

At present prices the margin of profit in the production of milk is so narrow that the farmers can not afford to act the part of philanthropists by the production of a higher grade of milk than the market demands and is willing to pay for.

On the other hand the farmers have a business sense which quickly leads them to produce the grade of product for which they can obtain the largest margin of profit.

The important fact which stands out clearly in the present situation is that while the farmers are able and willing to produce a sanitary milk whenever such production is the more profitable they can not be expected to continue such production whenever there is greater profit in the making of dirtier milk.

The lessons which have been taught by this five years' study of a municipal milk supply indicate fairly clearly that the farmers are prepared to produce any grade of milk which the market desires. They will produce it as soon as the market clearly states its wants and offers a price which will make the production reasonably profitable.

Under present conditions there is a demand for milk for three distinct purposes: for the feeding of infants, use by adults at table, and for cooking. The simplification of the municipal milk problem lies along the line of defining and establishing commercial grades of milk which shall correspond to these market demands.

Whenever it becomes possible to buy milk by such grades and feel sure that the milk is true to grade the supply upon the market will become just as clean and pure as the purchasing public desire it to be.