

would be realized within rational and economic limits. Such an arrangement clearly requires the co-operation of the food producers and the food research organizations with the Ministries of Food, Health and Agriculture and, almost certainly, at some stage in the third phase of inquiry, guidance by the Medical Research Council on the need and pattern of further research.

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SIXTY-SEVENTH SCIENTIFIC MEETING—THIRTY-FIRST  
SCOTTISH MEETING

HANNAH DAIRY RESEARCH INSTITUTE, KIRKHILL, AYR

21 APRIL 1951

MILK

*Chairman:* PROFESSOR R. C. GARRY, *Institute of Physiology, University of Glasgow*

**Trends in Milk Consumption in Great Britain**

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This Society last devoted a whole day to milk in July 1943 at a joint meeting with the Food Group of the Society of Chemical Industry. In the first paper at that meeting Mr J. L. Davies (1944), of the Milk Marketing Board, discussed the changes in the supplies of liquid milk which had occurred between 1933 and 1943 and posed a number of questions. Among these were: What should be the rate of liquid milk consumption to meet a progressive nutritional policy? How much milk would people buy when other foods become plentiful again? Would supplies be sufficient to meet the high nutritional requirements he postulated?

Data collected during the 8 years since that meeting suggest some answers to these questions. It is proposed here to discuss some of these data.

*Trends in national supply.* Before the war the Advisory Committee on Nutrition of the Ministry of Health (Ministry of Health, 1937) reviewed the production and use of milk in the United Kingdom and studied the trends which had taken place in the consumption of milk and its products during the first third of this century. The data below, which are extracted from that report, show the consumption of milk and milk products in 1909-13, 1924-8 and 1934-5:

	1909-13	1924-8	1934-5
Milk and cream (pt.)	3·46	3·35	3·26
Condensed milk (lb.)	0·05	0·14	0·23
Estimated total in equivalent pints	3·57	3·65	3·75

It will be noted that while the total consumption of milk and cream fell by some 6 % between 1909-13 and 1934-5 that of condensed milk increased between four and five times, and caused the total to increase by about 5 %. The report went on to discuss the reasons for the fall in liquid milk consumption and suggested that one might have been the change in the age distribution of the population. It also showed that between 1934 and 1936 there was a 64 % increase in the amount of milk used for manufacture, so that by 1936 as much as one-third of the total milk sold off farms was used for the manufacture of products for human consumption. In commenting on this change in the use of milk the Committee stated that 'much of the dried and condensed milk is used in confectionery and most of the remainder is in the form of condensed skimmed milk, which is not equivalent in its constituents to fresh whole milk'.

It is against this supply and utilization picture that the Advisory Committee's recommendations on desirable changes in milk consumption must be viewed. They recommended that children should receive from 1 to 2 pt. of liquid milk a day, expectant or nursing mothers about 2 pt. and other adult members of the population  $\frac{1}{2}$  pt. and estimated that these allowances would have represented an average of about  $\frac{7}{8}$  pt. of liquid milk daily per head of the population, an amount which was more than twice the then existing liquid milk consumption or about one and three-quarter times the total milk consumption.

The Advisory Committee did not discuss methods of inducing the population to buy and drink these quantities of milk. A start had been made many years previously in supplying free milk to needy mothers and children. In the early years of the century it could be obtained from local charities, but after the Maternity and Child Welfare Act was passed in 1918, any local authority was permitted to supply cheap or free milk to poor mothers and children against a medical certificate. In 1935-6, the Milk Marketing Board, the trade and the Commissioner for Distressed Areas co-operated in starting a cheap milk scheme for mothers and children in the Rhondda Valley, Whitehaven, Jarrow and Walker-on-Tyne, and in August 1939 the Ministry of Health introduced a national cheap milk scheme on an income basis. At the end of the twenties the National Milk Publicity Council started promoting the sales of milk in schools, and in 1934 the Milk Marketing Boards and the distributive trade, in co-operation with the Education Departments, started the Milk-in-Schools Scheme which gradually grew in importance until in 1939 over half of the pupils in grant-

aided schools were taking school milk. The children could buy one-third of a pint daily at school for  $\frac{1}{2}d.$ ; those from very poor homes could obtain it free.

In spite of these efforts to increase milk drinking, the national consumption in 1939 was still far below the Advisory Committee's target. The outbreak of war made complete control of the national milk supplies a necessity, and therefore the initiation of a system of milk priorities a possibility. Early in the war the Ministry of Food took three main steps to implement the Government's nutritional policy on milk. It encouraged milk production; it diverted milk from manufacturing to liquid consumption; and it introduced the National Milk Scheme. The extent to which the first two objectives were achieved is illustrated below:

	1933-4	1935-6	1938-9	1941-2	1945-6	1948-9	1950-1
Total sales off farms (gal. $\times 10^6$ )	950	1163	1253	1208	1405	1630	1826
Percentage for liquid market	74	65	68	89	89	89	83

Total milk sales did not begin to rise above the prewar level until 1943, but the diversion of milk from manufacture to the liquid milk supply had started to become effective by 1940, and it will be noted that after 1941 and until the present year nearly 90% of the total milk sales have gone for liquid consumption.

The National Milk Scheme, which later became part of the Welfare Foods Service, was introduced in July 1940 and provided milk free or at a special price for all expectant and nursing mothers and young children irrespective of income. Another important measure implemented shortly afterwards by the joint action of the Ministry of Food and the Education Departments was the expansion of the Milk-in-Schools Scheme. By the beginning of 1943 about three-quarters of the school population was taking milk at school, compared with just over half in 1939. School milk was taken by about this proportion of children until after it became free of charge in August 1946. Since then nearly 90% of school children have taken school milk.

The increase in milk production and the diversion of milk from manufacture were not sufficient to meet the requirements of the National Milk Scheme and the expanded Milk-in-Schools Scheme, and in April 1941 restrictions had to be imposed on milk purchases by adults or, as they came to be called, 'non-priority consumers'. At the same time it became necessary to arrange for special allowances of milk for certain categories of invalids, and in October 1941 a priority claim on milk supplies was also arranged for older children and adolescents. This system of allocation remained substantially unchanged until supplies of liquid milk became sufficiently plentiful in 1950 to obviate any further need for controlled distribution. When milk was fully controlled the following priority domestic allowances were available:

Priority class	Weekly allowance (pt.)
Expectant mothers	7 cheap or free and adult's allowance at full price
Children 0-1 year	7 cheap or free and 5 at full price
Children 1-5 years	7 cheap or free
Children 5-18 years	$3\frac{1}{2}$ at full price
Certain groups of invalids	7-14 at full price

In addition to these, all school children were entitled to  $\frac{1}{3}$  pt. of milk a day at school,

and special arrangements were made for children unable to attend school or living in institutions.

These quantities were guaranteed throughout the year, but as milk supplies vary seasonally, it is clear that the amount left over for the non-priority consumers could not remain constant throughout the year: in the autumn and winter it often fell to 2 pt./head/week; in the late spring and summer it usually rose to 3 or 4 pt./week. At certain seasons of the year over half the total supply went to priority consumers (comprising about a quarter of the population), compared with just under 40 % when

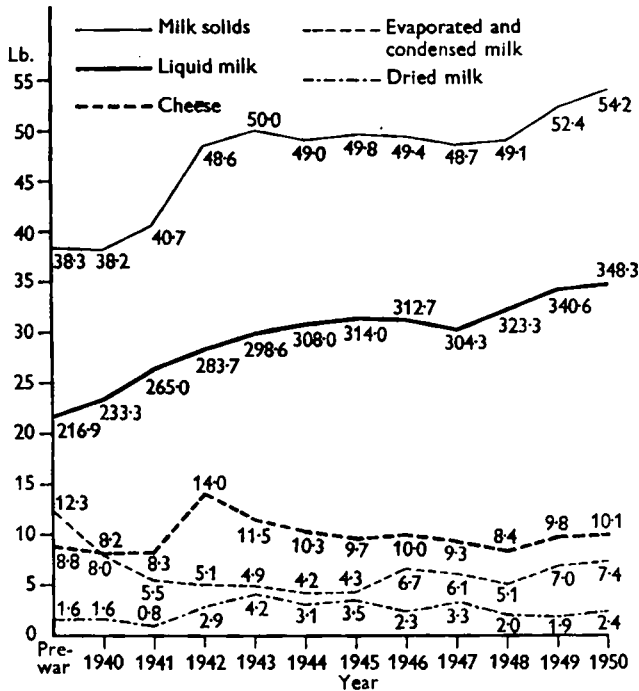


Fig. 1. Supplies of milk and milk products moving into civilian consumption in lb./head/year in the United Kingdom, prewar to 1950.

milk was most plentiful (Capstick, 1947-8). Milk was decontrolled in January 1950 and after that date the only priority allowances were the 7 pt. weekly supplied cheap or free under the Welfare Foods Service to expectant mothers and children up to the age of 5, and school milk.

The trends in the national supplies of milk and milk products that have occurred since 1939 can be seen in the estimates of the 'total supplies of foods moving into civilian consumption' which are published from time to time. The most recent appeared in a White Paper *Food Consumption Levels in United Kingdom* (Ministry of Food, 1949). The average total supplies for the United Kingdom of liquid milk, milk products and total milk solids (including cheese) have been extracted from this report and, with some as yet unpublished later estimates, have been graphed in Fig. 1; the points on the graph represent yearly averages. From this graph it will be seen that

total milk solids have increased by over a third between 1939 and 1950 and liquid milk itself by over half. The increase in liquid milk has been fairly uniform except for a slight setback in 1946, and a more serious shortage in 1947 caused largely by the very cold winter of 1946-7 followed by the prolonged drought in the summer of 1947. Total milk solids have shown a different trend with a sharp increase in 1942 caused mainly by the increased imports of cheese and dried skimmed milk after the passing of the Lend Lease Act in the United States. It will be noted that the 1950 milk-solids figure is almost up to the level (55.5 lb./head/year) recommended in 1947 by Dr Magee and his collaborators as a desirable target for this country (Bransby, Magee, Bowley & Stanton, 1947). It is also of interest to note that although the average supply of cheese was lower in 1950 than in 1942, it is still significantly higher than at the prewar level: 10.1 lb./head/year compared with 8.8.

This paper has, so far, dealt only with national supply trends and the provisions that have been made to enable mothers and children to obtain the milk that has been recommended for them. Other data on milk consumption are, however, available and will now be discussed.

*Data on milk consumption.* In 1940 the Ministry of Food initiated a National Food Survey which has been carried on continuously since that time. The first report on the results of this survey, which is now in the press, gives full details of techniques used, but it may be useful to state briefly that for the greater part of its history the survey has provided records of the domestic consumption of foods and expenditure on foods bought for use in the home by urban working-class households.

The results during 1940 and 1941 (Ministry of Food, 1941, 1951*a*) are particularly relevant to any study of milk consumption as they throw some light on the changes which took place after the National Milk Scheme came into force and after the supply of milk for adults was restricted. Table 1 shows some of the trends which were taking place during 1941. The figures for 1940 have not been included as they resemble closely those for the early months of 1941.

Table 1. *Average consumption of household and school milk*

(National Food Survey of 1941, Ministry of Food, 1941)

	8 Jan.-16 Feb.	28 Apr.-26 June	28 July-6 Sept.	27 Oct.-6 Nov.
Average consumption (pt./head/week):				
All households	3.3	3.2	3.4	3.2
Households without children under 14	3.6	3.3	3.6	3.1
Households with children under 14	3.2	3.2	3.2	3.3
Average consumption of National Scheme milk per child under 5:				
Pt./week	5.8	6.3	6.4	6.5
Percentage of entitlement	83	90	91	93
Average consumption of school milk per child aged 6-14 (pt./week)	0.7	1.0	0.6	1.4
Milk obtained under special schemes as percentage of total milk	18	19	18	22

One effect of the restriction on the supply of milk to adults at a time when the amount of National Scheme milk and school milk taken was increasing, was to raise the average amount consumed per head in households with children above that in childless households. This difference in favour of households with children appeared for the first time in the fourth quarter of 1941 when households with children bought an average of 3.3 pt./head/ week and childless households 3.1, compared with 3.2 and 3.6 pt./head/week at the beginning of the year. By the fourth quarter of 1941, 22 % of all liquid milk supplied to surveyed households, all of which were urban working-class households, was obtained under these schemes. The average amount of National Scheme milk was 6.5 pt. a week for each child under 5, and of school milk 1.4 pt. for each child aged 6-14.

Although sales of milk off farms did not rise above the prewar level until 1943, the reduction in the quantities processed into cheese and other milk products made possible a steadily increasing liquid milk consumption by urban working-class households from 1941 onwards. The records of the consumption of milk by the urban working-class households surveyed are summarized in Table 2 which is extracted from the report of the Ministry of Food (1951*a*) already referred to.

Table 2. *Domestic consumption of liquid milk, expressed as pt./head/week*

(National Food Survey of 1942-9, Ministry of Food, 1951*a*)

Year	Milk retailed at full price	National Scheme milk	School milk	Total	Average non- priority allowance	No. of households	No. of surveyed persons
1942	2.6	0.7	0.2	3.5	2.5*	8567	29,493
1943	2.8	0.9	0.3	3.9	2.6	9141	31,733
1944	2.9	0.9	0.2	4.0	2.5	7263	26,015
1945	2.9	0.9	0.3	4.1	2.4	7225	24,968
1946	2.9	0.9	0.2	4.0	2.4	8204	29,260
1947	2.8	0.9	0.2	3.9	2.4	5942	21,334
1948	2.9	0.9	0.2	4.0	2.5†	5623	20,178
1949	3.3	0.9	0.2	4.4	2.7‡	7119	25,737

\* Unrestricted sales for 17 weeks.

† Unrestricted sales for 3 weeks.

‡ Unrestricted sales for 15 weeks.

These results show that by 1945 the average consumption among the urban working-class households surveyed was 4.1 pt./head/week, or more than one-third greater than the average of 3.0 pt. recorded in 1937-8 by the Ministry of Labour (1940). This increase is, of course, to be attributed partly to the wartime rise in incomes, but it was partly the result of the Milk Schemes. In the last quarters of 1944 and 1945 National Scheme and school milk together represented 30 % of all milk consumed by the surveyed households, compared with the 22 % for the last quarter of 1941.

After the war the continuous increase in milk consumption by urban working-class households suffered a slight check owing to supply difficulties, but by 1949 it had risen to 4.4 pt./head/week or nearly 50 % more than before the war. The increase from 1948 to 1949 was largely in the form of milk retailed at full price and represented an

improvement in the diet of the general consumer. It is important that this should have happened at a time when the diet was becoming more varied, although it must be remembered that at its subsidized price milk was still economically attractive compared with many of the more expensive foods responsible for the increased variety of the diet.

*Survey of May-June 1949.* Until milk was decontrolled it was impossible to tell whether or not the 50 % increase in milk supplies between 1939 and 1949 was sufficient to meet current demand. Nor was it possible under restrictive conditions to gauge how people in different income groups shared in the general increase. When milk supplies were sufficient to permit temporary decontrol, between the end of March and mid July, 1949, the Ministry of Food took the opportunity to seek an answer to these questions in an *ad hoc* consumer survey. The results of this survey have already been published by the Ministry of Food (1950a) but they will be reviewed briefly here.

The survey covered 2400 households containing 8600 people, broadly representative of all economic groups, urban and rural areas being represented in their correct proportions. Housewives were asked how much milk they were buying and whether it was more than they had been buying before milk was decontrolled; if they were not buying more they were asked why.

The results of the survey showed that the supply was adequate to meet the demand at the then current prices: only 1 % of the housewives said they were unable to buy more because the milkman could not deliver it. This does not mean, however, that all families could obtain all they wanted, because of those housewives who had not increased their milk purchases to any marked extent after decontrol 23 % (17 % of the total sample) did not do so because of its cost. This proportion varied from 5 % in the highest income group to 41 % in the lowest.

The average domestic consumption per head per week of all consumers was found to be about 4 $\frac{3}{4}$  pt. Assuming that priority consumers were taking up their allowances in full, this meant that the weekly consumption of non-priority consumers averaged about 4 pt./head. It is of interest to compare these results with those found in surveys made before the war. A comparison is made in Table 3.

Table 3. *Domestic purchases of liquid milk, May-June 1949 and according to prewar surveys, expressed as pt./head/week*

Income group	Average purchases			
	Crawford & Broadley (1938) 1936-7	Orr (1936) 1934	Ministry of Food (1950a) 1949	
			(a)	(b)
A	5.1	5.5	6.0	5.8
B	4.4	4.2	5.5	5.3
C	2.6	2.6	4.5	4.8
D	1.6	1.1	4.5	3.7
All households	2.9	3.1	4.8	4.8

Crawford & Broadley and Ministry of Food (a) groupings based on income of heads of households.

Orr and Ministry of Food (b) groupings based on average income per head.



Comparison cannot be exact since the procedures used in the prewar and postwar surveys were not identical. The only two published prewar surveys that can be used for an income-group or social class comparison are those of Orr (1936) and that of Crawford & Broadley (1938). Orr's data were based on surveys conducted from 1932 to 1935 and his national estimates made for 1934, and Crawford & Broadley's covered the months October 1936 to March 1937. Income groups in Orr's *Food, Health and Income* were based on estimated average income per head in the family, in Crawford & Broadley's *The People's Food* on the incomes of heads of households. Orr's data on milk covered total consumption, including milk drunk in catering establishments and schools, and Crawford & Broadley's covered consumption in the home only. However, despite these differences and the fact that neither of the prewar surveys was seasonally suited for comparison with milk consumption in May-June 1949, it is of interest to draw up a comparison between the three sets of figures. In Table 3, group A is the highest income group and group D the lowest. In the three surveys group A comprises 5-10 % of the sample, group B about 20 %, group C about 60 % and group D 10-15 %.

In spite of the inexactness of the comparisons the broad result is unmistakable. According to the prewar surveys the upper 5-10 % of the population drank more than three times as much milk as the lowest 10-15 % and about twice as much as the main working-class group, who represented 60 % of the population. In May-June 1949 the difference between the groups was strikingly smaller: the highest group was then consuming little more than one-third to one-half more than the lowest. To express this another way, while the whole population had on the average increased its consumption by one-half compared with before the war, working-class consumption had nearly doubled and that of the poorest had trebled.

*National Food Survey.* The trends in milk consumption have been studied further since the survey of May-June 1949. The National Food Survey which had previously covered mainly urban working-class households was reorganized in 1950 so that it would include all sections of the population, and from the results of this survey it is possible to compare the total milk consumption (including school milk and processed milks) by families of different social class and different size. The months during which the survey took place in 1950 were January, February, April, May, July, August, October and November. The total number of households surveyed was 4723: these contained 16,554 persons. The data which follow are taken from unpublished reports of the Ministry of Food (1951*b*).

In Table 4 the consumption of liquid and processed milk by social classes is compared with that of the similar social classes surveyed by Crawford & Broadley (1938). This table shows the same broad result for liquid milk as the previous one. In addition, it will be seen that in 1950 the class A households received a quarter more of all milks than they did in 1936-7; the class B households a third more; the class C households three-quarters more; the class D households one and a quarter more and all households two-thirds more. It was known that the lowest income groups relied considerably on sweetened condensed skim milk before the war. In 1950, however, this product accounted for less than a quarter of the working-class consumption of processed milk:



Table 4. *Household consumption of milk and milk products according to social class, expressed as pt. or equivalent pt./head/week. 1950 compared with 1936-7*

Social class	Percentage of population		Average consumption					
	Crawford & Broadley (1938) 1936-7	Ministry of Food (1951b) 1950	Liquid milk		Processed milk		Total	
			1936-7	1950	1936-7	1950	1936-7	1950
A	5	3	5.1	6.3	0.05	0.2	5.2	6.5
B	20	13	4.4	5.4	0.1	0.4	4.5	5.8
C	60	58	2.6	4.7	0.3	0.4	2.9	5.1
D	15	26	1.6	4.4	0.5	0.3	2.1	4.7
All households	100	100	2.9	4.8	0.3	0.4	3.2	5.2

three-quarters was made up of about equal quantities of whole condensed or dried milks. The nutritional importance of the increased consumption in the lowest income groups is therefore even greater than appears from this table.

An analysis of the variation in milk consumption between households of different size also has been carried out on the results of the 1950 survey. The most extensive prewar survey which studied the effect of family size on milk consumption was that in 1938 and 1939 of Murray & Rutherford (1941). These workers showed, however, that although incomes and the numbers of adults and children in the household affected milk consumption, these factors were not the whole explanation of the divergences found. Regional differences and habit and taste factors were also important. It has not been found possible to compare the present data on family size with those of Murray & Rutherford and therefore no prewar comparisons can be made with the 1950 findings, which are shown in Table 5.

Table 5. *Household consumption of milk and milk products according to family composition, expressed as pt. or equivalent pt./head/week*

(National Food Survey of 1950, Ministry of Food 1950b)

No. of persons per household	Household composition	No. of households surveyed	Consumption			Requirement‡
			Liquid milk including school milk	Other milk	Total	
2	1 man, 1 woman only*	688	5.5	0.3	5.8	3.6
3	1 man, 1 woman, 1 child†	634	5.3	0.5	5.8	5.0
4	1 man, 1 woman, 2 children	567	5.1	0.5	5.6	5.7
5	1 man, 1 woman, 3 children	198	4.9	0.6	5.5	6.0
6.5	1 man, 1 woman, 4 or more children	112	4.3	0.6	4.9	6.4
3.2	1 man, 1 woman and adolescents†	214	4.8	0.3	5.1	4.8
5.4	1 man, 1 woman and adolescents and children	331	4.2	0.3	4.5	5.8

\* Excluding all old-age pensioner households.

† Child = under 14 years, adolescent = 14-20 years, adult = 21 years and over.

‡ Calculated according to Advisory Committee on Nutrition recommendations (Ministry of Health, 1937).

It will be seen from this table that the households containing adults only drank more liquid milk per head than any of the other types of households, but that if processed milks are taken into account the households containing one child under 14 equalled the childless households and the households containing two and three children almost did so. The large families and those containing adolescents fared worse.

The Ministry of Health (1937) Advisory Committee's recommendations on the amount of milk required by people of different ages have already been mentioned. The requirements of the average families shown in Table 5 have been calculated on the assumption that children aged 0-1 should drink 2 pt. of milk a day and all other children and adolescents up to the age of 21, 1 pt., expectant mothers 2 pt. and other adults  $\frac{1}{2}$  pt. It will be seen, that, according to this calculation, childless households, households containing one child and households containing adolescents were apparently meeting their milk requirement, households containing two or three children were almost doing so, households containing four or more children and those containing both children and adolescents were failing to do so.

No earlier data with which to compare these estimates are available; it is therefore impossible to suggest trends for families such as these. The numbers of large families studied during 1950 were small, but the figures for each quarter were remarkably consistent and showed that families containing two adults and three or more children or adolescents did not buy the quantity of milk that has been recommended even though milk is now readily available. It is not easy to determine whether this is due to the high milk bill in spite of the very cheap rate at which milk for children can be obtained or whether it could be remedied by education. It is important to realize, however, that this difference between large and small families is almost certainly not a new situation, and the milk consumption of large families is probably greater than it was before 1939, but the fact that they are getting less than their share of milk in spite of the Welfare Foods Service and the Milk-in-Schools Scheme suggests that more education in milk drinking is required.

#### SUMMARY

The trends that have been discussed may be summarized as follows:

1. As a result of increased production and the diversion of milk from the manufacturing to the liquid market, liquid milk consumption in Great Britain has increased by over 50 % between 1939 and 1950.
2. Largely as a result of the Government's distribution policy, combined with greater purchasing power among the poor, the gap between the milk consumption of the upper and lower income groups has been narrowed.
3. It appears that in addition to special incentives in regard to price, more education may be necessary if the Welfare Foods Service is to be fully effective in furnishing adequate supplies of milk to the larger families.

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### Research in Dairying—A Survey

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Text not received for publication.

### Changes in Milk Production in Great Britain during the Past Half-century

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#### *Organization of the industry at the beginning of the century*

The producers of milk and dairy produce at the beginning of the century and up to the twenties could be grouped into a series of zones. This was necessitated by the comparatively primitive methods of handling and transporting milk, and also to a considerable extent by the consumers' prejudice against milk that had been cooled and delayed for more than a few hours in its progress from the cow to the breakfast table.

Cows were kept in many towns and large cities, so that milk could be delivered quickly, and be handed to the consumers fresh and warm from the byre. Often the only land attached to the 'town dairy' was an exercise yard, or paddock, so that no pasturage or arable crops were available, and all food had to be bought. This necessitated a steady supply of purchased hay, straw and roots, as well as more concentrated feeding-stuffs, and also a ready market at all times of the year for the manure. Thus, the system survived longest in the towns where, within easy carting distance, there was land well suited for arable cultivation, with farms ready to sell farm crops and to buy back manure.

The system also required the constant renewal of the cow population because breeding or rearing of stock was rarely attempted. Newly calved cows of a dual-purpose type were bought and milked as long as they continued to give a satisfactory yield. They were fed heavily, and by the time the yield of milk had dropped to about 1 gal./day, they were sold for slaughter as fat cows and replaced by new purchases. I need not say anything about the objections on the part of the health authorities to the keeping