

Dairy Industry of Israel

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1. INTRODUCTION

The cattle industry provides about 11% of the value of agricultural production in Israel with two thirds of this being derived directly from dairy products and most of the residue coming from beef originating from either fattened male dairy calves or cull cows and heifers.

The industry had its origins nearly a century ago but has made dramatic strides in the past 30 years. This chapter discusses some of the factors associated with the rapid modernisation of the industry.

2. AGRICULTURE AND MILK PRODUCTION BEFORE 1948

In the traditional, subsistence, Arab agriculture of the 19th and early 20th century Palestine, where oxen were the major draught animals, small dual purpose cattle supplied limited quantities of milk and beef, mostly for home consumption. Feed was almost exclusively from grazing and lactations were short and yielded only 200–500 kg.

The German Templers were the first to introduce European milk-type cows to the country and to grow forage crops when they established a market-oriented agriculture late in the 19th century. Jewish agriculture, which started at the same time, also tried modern European methods and livestock, some of them transferred from the German farms. With improved management and better feeding, milk yields of local cattle were raised to 500–1000 kg per cow per annum. Even better yields, of 2500–3000 kg, were given by the Damascus Red cattle imported by Jewish settlers from Syria early in the 20th century.

Early importations of large numbers of European cows failed, however, as many perished from tick fever and, as was then believed, from inability to adapt to the subtropical climate. Consequently, breeding efforts until World War II were directed to upgrading the Damascus Red cow through mating it with Dutch Friesian bulls. The offspring of these crossings yielded over 4000 kg milk per cow per annum. Further out-crossings did not raise yields significantly but this gradual transformation of the herd from local to European types induced a learning process by which management practices and health care improved. Thus, by 1934–1935 it was possible to successfully import 600 Dutch Friesian cows. These were distributed mainly in the tick-free areas of the hills of Jerusalem and the southern plains.

With this background of experience the dairy industry was able, after the establishment of the State of Israel in 1948 and the increased demand for

milk, to absorb 15 000 Holstein heifers and cows imported from North America and distributed to newly established farms. The Damascus-Friesian crossings and the pure Friesian and Holstein types formed the basis for the present Israeli-Friesian milking herd.

The intensification of dairy production in Jewish agriculture was part and parcel of its general development process. Three major farm types were prevalent in this sector before 1948 and are still found in Israel today: (1) monoculture farming (particularly citrus orchards and vineyards) on privately owned land; (2) cooperative farming: family-operated units in a *moshav* village; (3) *kibbutzim*, with a communal organisation of production and consumption. The last two groups farm state lands and are usually mixed farms.

The policy of supporting mixed farming with milk production as its central axis is based on a series of economic, social, agrotechnical and ideological arguments: dairying provides a constant flow of income and its balanced labor demand is consistent with the requirement that state lands be cultivated by the farmer himself and not be used to exploit hired labor; forage crops are essential for an efficient crop rotation; dairy manure increases soil fertility and livestock production is a natural way to intensify the farm operation and secure adequate income on the limited land allotted to settlers. A dairy enterprise is an efficient saving channel for the farmer who starts with no capital of his own and with a minimum of production assets (including only one or two cows) supplied on long-term credit from a state loan.

Transportation difficulties and increased urban demand, particularly during World War II, encouraged the development of milk production in sheds constructed on the outskirts of cities and towns. These dairies relied exclusively on purchased feed and often marketed their milk directly to neighbourhood consumers. Their operators were not part of the politically powerful 'organised agriculture', a fact which turned out later to be detrimental to their existence.

While the typical production unit in the *moshav* is the family farm with, in the early days, one to five milking cows, the scale of operation in the *kibbutz* is much larger. Already in the 1930's its average herd size was more than 50 milking cows with the larger enterprises operating dairies of 120 to 140 cows. The technology in both sectors was, however, up to the World War II, very similar: milking was by hand and the use of machinery, even on the larger farms, was limited. Economies of scale were thus not realised by mechanisation, however the structure of the *kibbutz*, with members forming teams to operate its various activities, did facilitate worker specialisation. The *kibbutzim* were, therefore, more active in the Israeli Cattle Breeders Association which was founded in 1928 and milk recording, which started in 1934, has always been conducted almost exclusively in the *kibbutz* dairies.

3. PATTERNS OF DEVELOPMENT SINCE 1949

The 1948 war and the developments thereafter dramatically changed the economic conditions in the country. Over two thirds of the rural Arab population left as war refugees. The pre-1948 Jewish population doubled by 1950 due to immigration which continued thereafter, albeit at a much slower rate. The Israeli economy was characterised, up to 1953, by low levels of income, inflation and acute shortages of both necessities and foreign exchange; this resulted in strict price controls and the rationing of food and raw materials. Unemployment and the need to supply food to the growing population induced public investment in agriculture, particularly for water supply and

resettlement: 214 new moshavim and 71 new kibbutzim were added between 1948 and 1953 to the 72 and 145, respectively, that were already established. The realisation of the fruits of the national investment efforts, of which agricultural development was a major part, and the increased inflow of capital, gradually alleviated the economic difficulties of the earlier period, and by 1953–1954, the country started on a fast and sustained economic growth path that has continued, with only limited interruptions, up to the present.

The major developments in the national dairy herd since 1949 are summarised in Table 21-1 and Fig. 21-1. The number of milk cows grew from 18 500 in 1949 to 102 000 by the end of 1974. The Holstein importation from the United States, new settlements and the reconstruction of war crippled dairies were the main components of the growth of the early 1950's. Another upswing in the number of cows occurred after 1956 in response to rising beef prices and the relaxation of feed rationing when American grain surpluses were imported under Public Law 480 and the livestock industry enjoyed, for the first time, a reliable feed supply.

The stagnation and temporary reduction in the number of cows in the first half of the 1960's reflect the saturation in the milk market and the imposition of production quotas. These developments encouraged the search for export markets and in 1961 the Israeli Cattle Breeders Association began exporting heifers to Iran. Since then some 13 000 heifers have been exported to this and other Mediterranean countries. Production quotas were lifted twice, in 1966 and in 1972, and then reimposed when the milk supply had expanded sufficiently to cover demand at prevailing prices.

The national average milk yield was 4058 kg per cow per annum in 1949, it fell shortly thereafter, when cows were distributed to new settlers and an adequate feed supply could not be assured, and rose again to reach a level of 5845 kg by 1976. However, there is a distinct yield difference between those herds registered in the herd book, and the rest of the national herd (Fig. 21-1). Part of this difference is attributable to the fact that while milking is done three times daily in most of the registered herds (in the *kibbutzim*), two milkings is the rule in most other herds. Perhaps more significant than

TABLE 21-1

Israeli dairy herd 1934–1974

| Year | Registered herds | | | National herd ^a | | |
|------|------------------|--------|-----------------------------------|----------------------------|-----------------------------------|--------------------------|
| | No. of herds | Cows | Milk yield (kg per cow per annum) | Cows in national herd | Milk yield (kg per cow per annum) | Male calves in feed lots |
| 1934 | 12 | 1 209 | 3960 | 10 000 ^b | | |
| 1939 | 31 | 2 372 | 3847 | 10 940 | | |
| 1944 | 69 | 5 303 | 4227 | 18 000 ^b | | |
| 1949 | 88 | 7 833 | 4044 | 18 530 | 4058 | |
| 1954 | 198 | 14 332 | 4197 | 37 800 | 3703 | |
| 1959 | 181 | 16 917 | 5347 | 59 000 | 4246 | 24 500 |
| 1964 | 200 | 24 013 | 5694 | 67 100 | 4665 | 40 400 |
| 1969 | 213 | 34 132 | 6271 | 82 100 | 4855 | 49 300 |
| 1974 | 210 | 47 172 | 6621 | 101 900 | 5283 | 53 000 |

Source: Israel Cattle Breeders Association.

^a excluding native cattle in traditional farming.^b estimated.

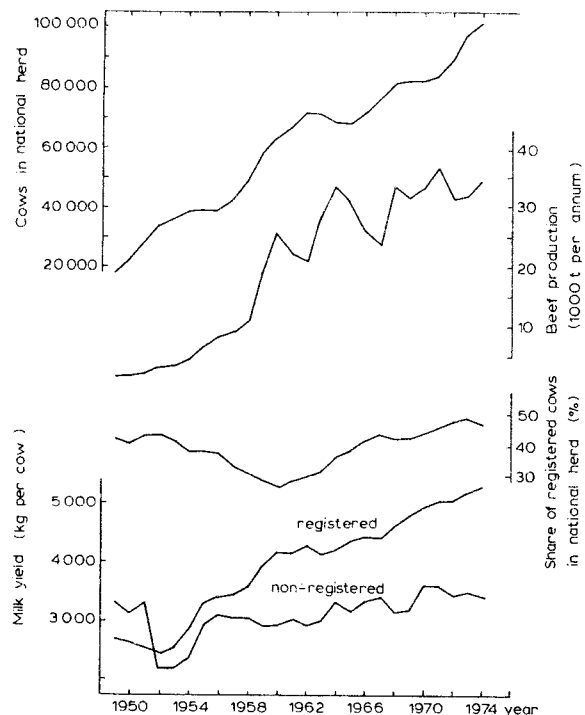


Fig. 21.1. The Israeli herd.

the difference in yields is the difference in its rate of change: while milk yields in the registered herds have been growing constantly since the early 1950's, yields in the non-registered herds have been essentially stagnant. Fig. 21-1 indicates that since 1962 the proportion of the national herd that is registered has steadily risen so that an increasing proportion of the national milk supply is coming from registered cows.

Milk prices are fixed (and subsidised) by the government and adjusted to take account of inflation. Nevertheless, the ratio of the producer price of 1 kg milk to the price of 1 kg of concentrates, a major component of the terms of trade of the industry, has steadily declined (Fig. 21-2). The ratio was 2.40 in 1950 and 1.3 in 1976. The ratio of the producer price of 1 kg of beef to that of the same quantity of feed concentrates rose with the relaxation of price controls in 1953 and with increasing income and demand. It reached 16.9 in 1958, declined by 25% in the two following years, and then fluctuated around its new level for several years before falling again in the 1970's: in 1976 it was 8.8.

The post-1953 beef prices and the ample supply of P.L. 480 feed grains after 1955 induced the development of a new activity, the growing in feed-lots of male calves which hitherto had been slaughtered at the age of 1 week. The growing period was, initially, 16 to 18 months with bulls marketed at a weight of 400 kg. Today bulls are grown for 12 to 14 months to an average weight of 470 kg. Higher beef prices also speeded up the turnover in milk cows, and all female calves are now grown on to facilitate the replacement of low yielding cows. This has helped not only to augment milk yields but also to increase beef supplies since the second half of the 1950's. More recent developments in beef production reflect long-term technological changes and the growth of the milking herd as well as short-term fluctuations associated with the intensity of culling dairy cows. Since Israel has never been self sufficient in beef, marketing was always possible and surpluses never occurred.

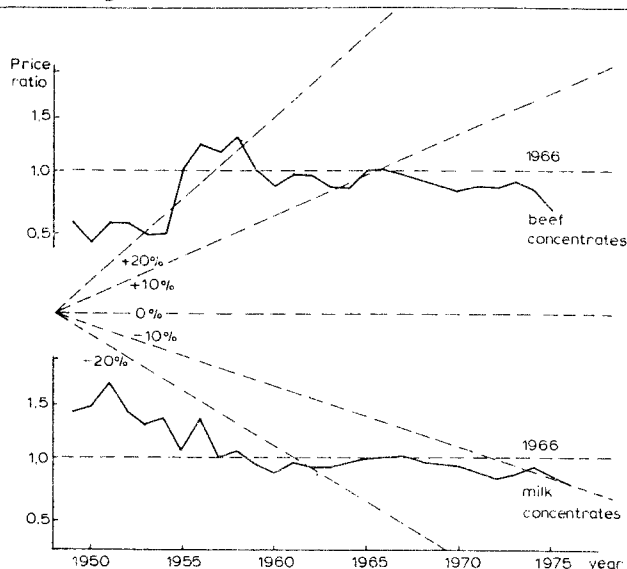


Fig. 21.2. Price ratios of concentrates to animal products.

The Arab villages in Israel continued to farm in a traditional manner for several years after 1948. However, with rising incomes and a strong urban demand, the Arab rural sector has now undergone a process of integration into the general Israeli economy. This started through the labour market but later, when irrigation became available, Arab farming became completely market oriented, specialising in areas where it had comparative advantages. In some of these, such as off-season export vegetables, sophisticated modern activities have emerged. A modern dairy industry, however, has never developed in this sector, perhaps as a result of the lack of capital and limited access to credit. Beef is produced, but mainly on natural pastures.

4. RESEARCH AND BREEDING

Productivity has advanced in the cattle industry, along two distinct though related pathways: (1) through capital-intensive mechanisation: machine milking, modern structures, cooling systems; (2) through biological progress: feeding, health care, breeding; all of which are reflected in higher and more consistent yields per cow. Mechanical technology was mostly imported by farmers with the aid of the extension service but biological technology, either endogenously developed or *borrowed* from outside, has been coming through local research.

The research system and the experiment stations in Israel have generally interacted closely with the farmers, particularly with the better ones. Early studies concentrated on the influence of the subtropical climate on the performance of dairy cattle. With better management which has indicated the possibility of maintaining high-producing animals, even in the hottest parts of the country, this line of research has declined in importance, though some research still continues in relation to the lower fertility of dairy cows during the hot summer months.

Research was also instrumental in the introduction of machine milking and artificial insemination. Veterinary research practically eliminated tick-fever, brucellosis and tuberculosis. Research on feeding problems is a good example of experimental work which has followed the pioneering efforts of farmers: high concentrate diets were first tried with surprisingly good results

in a kibbutz dairy in 1952. The practice diffused gradually to other operators. These findings were corroborated later by the research system, hastening further the adoption of this feeding method by farmers. Other research topics which initiated or aided new feeding practices were: comparative studies between grazing and soilage; and the utilisation for feed of by-products such as straw, citrus pulp, poultry litter and whey.

Research on the possibility of accelerating puberty by increasing feed intake and by the earlier breeding of dairy heifers was started in the early 1960's. As a result of this work the age at first calving was reduced from 30 months in 1959 to an average of 24 months in 1971.

The interaction and collaboration between research and extension workers and farmers makes it difficult to assess what has been the effect of research on productivity. It seems, however, that the main contribution has been in continually monitoring scientific advances both in Israel and abroad and in conducting controlled experiments in which suggested practices could be checked against a wide spectrum of alternatives.

Breed improvement has played an important role in dairy development in Israel. The modern phase of selection in the national herd started in 1947 with the importation from Canada of 11 Holstein-Friesian bulls and 60 cows. This was followed by the establishment of eleven regional cooperative artificial insemination centres, each with one Canadian and a few Dutch or upgraded black and white bulls. By 1952, 85% of the national herd were served by artificial insemination and this share rose to 99% by 1960. The number of bull centres was reduced to two in the early 1960's with the improvement of semen preserving techniques. By 1969 all matings were conducted by frozen semen enabling the long term preservation of superior genetic material and free choice of breeding sires.

Milk recording and artificial insemination have facilitated the development of a progeny testing programme which commenced in 1952 and since 1955 has been operated systematically using superior proven bulls.

It has been estimated that this breeding program has contributed approximately 60 kg milk annually to the yield of the average heifer in the national herd. No reduction in genetic variance among the young sires tested has been observed and hence no slackening of yield improvement has yet taken place. Such a slowdown is expected to appear as yields approach the *biological ceiling* although, perhaps, the Israeli herd is still well below that achievement.

Although sire selection is carried out in the registered herd, since all cows in the country utilise the same artificial insemination centres, any genetic gains are distributed equally throughout the industry. In this context the stagnation of yields in non-registered herds (Fig. 21-1) is puzzling. Possibly this is attributable to selection being biased in favour of intensive management, or perhaps an interaction of genetic and environmental effects completely nullifies the potential genetic improvements. At this point in time we can only speculate on this issue although it may be of considerable social as well as economic and biological interest.

5. FEEDING AND MILK COMPOSITION

Feeding practices differ significantly by sector. In the early 1950's, the kibbutzim used dairy rations which contained more than 30% of concentrates. With time, as feed-grain supplies improved, experience confirmed the yield effectiveness of concentrates in the ration and the use of these increased so that in some herds they now represent over 80% of the energy consumed. This situation is also reflected in the decline of the area per cow of both

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green fodder and artificial, irrigated pasture which fell by a third and by two thirds, respectively, over the last 25 years.

The moshavim feed, in general, a higher ration of roughage than do the kibbutzim. This is partly a reflection on the fact that while a kibbutz uses its land and particularly the water not used for fodder production, for cotton and other high-income field crops, the farmer in the moshav cannot grow such crops profitably on his small plots and if he is a dairy operator he lacks the time to cultivate labour-intensive crops such as vegetables or export flowers. Thus land and water costs in the moshav are comparatively low and it is an economically sound policy to put these factors to use in producing feed, even at the risk of lowering milk yield per cow. However, the larger the herd a moshav farmer operates, the more his feeding practice resembles those of a kibbutz dairy.

High levels of concentrates generally reduce the content of milk fat (from 3.7% in the registered herd in 1934 to 3.2% in 1974, though fat production per cow grew as increased yield over-compensated for reduced fat percentage). Breeders and extension workers have sought to modify feeding practices to increase milk fat percentage since current practices are regarded as inefficient in terms of energy utilisation and harmful to the cows health. However, so long as the price structure favours yield at the expense of fat content it is doubtful whether farmers will focus their efforts other than on yield.

6. TECHNOLOGY, SCALE AND SPECIALISATION

The widening gap, depicted in Fig. 21-1 between the milk yields of the registered and the non-registered herds and the concentration of production on the better farms, as revealed by the increasing proportion of registered cows in the national herd, reflect two major aspects of the dynamics of the Israeli dairy herd: genetic improvement and farmers' turnover. These processes are affected by scale, capital availability, farmers skill and on- and off-farm employment alternatives; factors which are not distributed equally among cattle growers.

Mechanical efficiency and biological productivity are positively correlated. High capital-labour ratios allow large-scale dairies with high-level specialisation by the operators. Moreover, low yielding herds cannot repay the investment in modern, fully mechanised dairies. The kibbutzim operate comparatively large herds and, indeed, more than 80% of the registered cows are in this sector. Though some moshavim reach the kibbutz level of

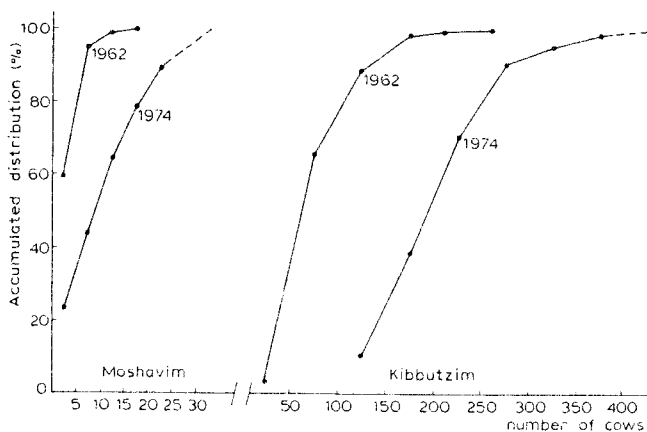


Fig. 21.3. Accumulated distribution of herd sizes on different types of farm.

productivity, yields per cow are typically lower and have been stagnant in this sector, where family-operated dairies run much smaller herds.

The scale of operation of the dairy enterprise in the family operated moshav and in the larger-scale kibbutz can be seen in Fig. 21-3. This shows that in 1962, 60% of the moshav dairies had between one and five cows and 35% had six to ten cows so that a total of 95% had ten cows or less. By 1974, the percentage of operators with one to five cows had declined to 22% while 12% had 20 cows or more; some of these larger enterprises operated 60 to 80 cows, mostly joint ventures of two families. The figure also reveals that in 1962 few kibbutzim operated dairies of less than 50 cows and the larger herds did not have more than 280 cows. The small size group disappeared by 1974 and some herds grew to have more than 400 cows.

The kibbutz dairies first realised significant economies of scale after the World War II, when portable milking machines were introduced. These spread throughout the sector in a period of several years. In the mid-1950's the larger kibbutzim introduced milking parlours. The adoption of this technology was completed by the early 1960's. These innovations required modifications in buildings and facilities on which the kibbutzim, seldom short on credit, readily embarked to save labour, their scarce factor. Indeed, labour requirement per cow, which averaged 40 days per annum when milking was manual, has been reduced to 10 to 12 days or less in modern milking parlours. Mechanisation on the family farm has been much slower, but has proceeded steadily and, by the last count, in 1971, 84% of these dairies were equipped with portable milking machines.

The scarcity of labour in the kibbutz and the associated higher alternative cost of this factor is a reflection of a higher capital-labour ratio. A rough estimate is that this is twice as high in the kibbutz as it is in the moshav. The kibbutz is also endowed with a better educated population. Most of the 'recent' moshavim (established after 1948) are inhabited by immigrants from Middle Eastern countries with comparatively low schooling levels. Dairy operators in the kibbutz are often college graduates and they participate in training programmes which may last several months, as well as undergoing periodic refresher courses. An operator of a family farm, particularly a livestock grower, cannot afford this kind of *luxury*.

These differences in cultural attributes are probably responsible for a great part of the difference between milk yields in the kibbutz and the moshav, particularly the more recently established moshavim. The private, urban area milk producers which before 1960 carried over 20% of the dairy cows (Table 21-2), also operated low productivity dairies. They specialised in the purchase of culled cows which they milked for short periods. To do this they capitalised on the comparative advantage of their proximity to the market.

TABLE 21-2

Distribution of milking cows in Israel by sector 1949-1974 (%)

| | 1949 | 1957 | 1964 | 1971 | 1974 |
|---------------------------|--------|--------|--------|--------|---------|
| Kibbutzim | 36 | 34 | 33 | 39 | 45 |
| Moshavim | | | | | |
| Recent ^a | — | 16 | 19 | 21 | |
| Established | 35 | 28 | 43 | 37 | 53 |
| Private and others | 29 | 22 | 5 | 3 | 2 |
| Number of cows in country | 19 100 | 40 000 | 67 500 | 86 000 | 102 000 |

^a Recent Moshavim: established after 1948.

During the late 1950's and early 1960's the percentage of the national herd found in the kibbutzim declined slightly (Table 21-2) due to the build up in new moshavim. However, since the second half of the 1960's productivity and technical economies of scale have tipped the balance significantly in favour of the kibbutzim whose share of the dairy herd has increased quite rapidly. It would probably have risen even faster had it not been for the imposition of production quotas which limited growth, especially in the most successful herds.

Economies of scale are not limited to the very large herds of the kibbutzim as can be seen from the trend in herd size shown by the moshavim in Fig. 21-3. Family-operated herds of less than 20 cows are no longer economically viable. However, while most size changes in the kibbutzim herds were achieved through growth of the same herds, an important part of the scale adjustment in the moshavim dairies was through the exit of operators. There were 5500 family-operated dairies in 1969; their number declined to 3500 by 1975. It seems that many small operators left milk production and turned to other activities. It was only the more efficient who could expand their operations, but even this expansion did not halt the increase in the share of the kibbutzim in the national herd.

Concentration of milk production in the hands of the better operators increased the national average yield and is one of the sources of the expanded national milk supply. In Table 21-3 the contribution of different factors involved in the increase in milk supply since 1960 is disaggregated. Of the increase 73.5% is attributable to the expansion in size of the dairy herd. On the assumption that breeding contributed 60 kg per cow per annum in the registered herds and none in the others, the selection effect explains 9.9% of the increased supply. Assuming that a cow added to a registered herd will yield the same as that herd's average yield, the added milk supply due to the fact that the share of registered herds grew over the period, accounts for 7.4% of the increment in supply.

The sum total of these three components adds up to 90.8%. This leaves 9.2% of the additional output as being contributed by factors associated with technological change in the industry, i.e. improvements in animal husbandry practices which are not accounted for by the three effects of the table. This means that breeding, concentration and technological change made approximately equal contributions to the increased productivity of the dairy herd over the 15-year period from 1960 to 1974.

Another special feature which has recently been observed is the concentration of male calves in the moshav family farms. The share of the kibbutzim in this activity is less than 20% of the country's total. It is not clear, however, whether this is just a temporary phenomenon, associated with the rapid expansion of milk production in the kibbutzim following the lifting

TABLE 21-3

Components of milk supply increment for the period 1960-1974*

| | (Million kg) | (%) |
|----------------------|--------------|------|
| Supply Increment | 278.8 | 100 |
| Expansion Effect | 205.0 | 73.5 |
| Selection Effect | 27.9 | 9.9 |
| Concentration Effect | 20.7 | 7.4 |
| Residual | 25.2 | 9.2 |

Source: Kislev and Rabiner (1976).

* The values in the table were calculated annually and added over the period.

of production quotas in 1972, and whether if quotas were to be reimposed the kibbutzim would move again into this activity.

7. MILK CONSUMPTION

The single most important factor explaining changes in the demand for milk and dairy products in Israel over the last 25 years has been the size of the population which has tripled over that period. It is, therefore, more revealing to discuss demand and consumption patterns in terms of per capita intakes rather than in terms of national totals.

The average urban Israeli family spends 10–11% of its food budget on milk and dairy products. Per capita fluid milk consumption averages 70–80 kg per annum, a level similar to that of France, Spain and West Germany but well below that encountered in Austria, Finland and Holland.

A rise in income in a poor country generally results in a marked rise in the demand for animal products; but at the standard of living reached by Israel, changes in income levels only have a limited effect on the consumption levels of basic foods. Thus an increase in per capita income of 5% per annum over the last two and a half decades in Israel (where the income elasticity of demand for milk is only 0.13) only led to a rise of 10–15 kg per capita in milk consumption. There was virtually no correlation between income and fluid milk marketing patterns (Fig. 21-4). The price elasticity of demand for milk is also low (0.10), and since the index deflated consumer price fluctuated within limited boundaries, this also exerted only a limited effect on consumption.

There are two other factors, product quality and population composition, which appear to explain most of the change in milk consumption. The first factor operated particularly in the earlier period, during the 1950's when milk supplied to urban centres was partly mixed with reconstituted powdered milk and expanded production enabled a gradual shift towards marketing the

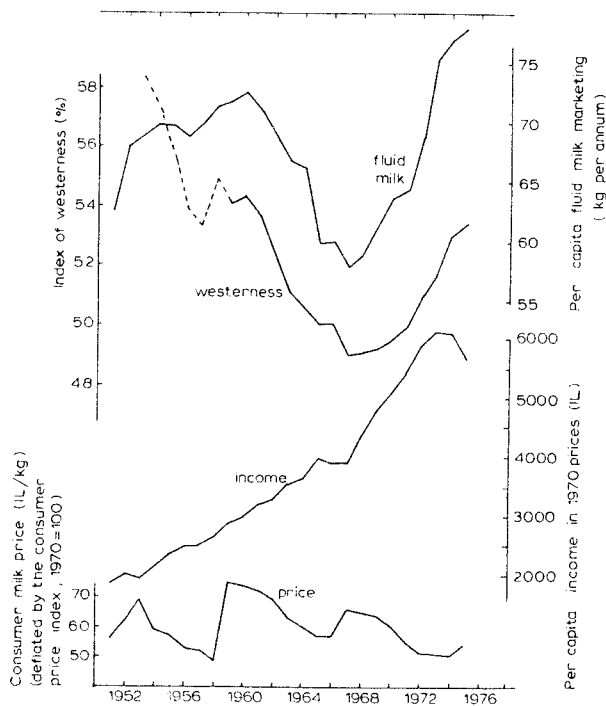


Fig. 21.4. Fluid milk marketing in Israel.

natural product. Marketing practices also changed during this period, from *open* marketing in jars at the consumers door to sealed bottles of pasteurised, homogenised milk. It has been estimated that this change alone increased per capita consumption by 8 kg per annum.

Milk drinking habits differ substantially between population groups. People of eastern origin, Israeli Arabs and Jewish immigrants of Mediterranean countries, consume only 70% as much dairy products as do families with a western background but of the same income level. The disparity in fluid milk consumption is probably even larger. Large waves of migration from Middle Eastern countries and differential birth rates increased the proportion of these groups in the population in the 1950's and 1960's. On the other hand, Israeli born people, even if of eastern origin, probably pick up some of the more dominating western habits. On these assumptions, an index of *westernness* has been constructed; it is defined as the proportion in the population of persons either of western origin or born in Israel of eastern families which are 15 years old and over (Ben-Yehuda, 1974). In Fig. 21-4 this index is compared with milk consumption patterns. The correlation is surprisingly strong (except for the early period when quality, and perhaps income changes, dominated) and augments the supposition that habits and cultural attributes are the major explanatory variables of per capita milk consumption in Israel.

Cheeses and other non-fluid-milk dairy products marketed in Israel today are very different from those available two decades ago. Hardly any products sold today were known in the 1950's and the (mostly low-quality) earlier products have disappeared from the market. The great variety of these products complicates any demand analysis but all the available estimates agree on a high income elasticity (of the order of 1.0) and, the consumption of non-milk dairy products has risen over the last 15 years at an average annual rate of 4%.

8. GOVERNMENT POLICIES

Since most of the Jewish agriculture in Palestine was established as part of a *national effort*, coordinated by public bodies and assisted in its early stage by capital inflows from abroad, it was naturally expected and accepted that after the creation of the State of Israel in 1948 the Government would pursue an active policy of economic intervention. In the early period, the most obvious and explicit activity was the settlement programme, including the importation of cows.

Another aspect of the Government's involvement was its intervention in the milk market. In the early 1950's, motivated by a desire to keep the price of this essential food item low, and at the same time to secure adequate farm incomes, the Government turned to a subsidy programme for milk. During the period from 1957 to 1975 the direct subsidy on milk was never less than 15% of the product's price in six years in that period it exceeded 30%. Feed grains were also subsidised, often at rates similar to those for milk.

As a result of this subsidy programme, consumer milk prices have been kept low. During the period 1965-1971, for example, they were approximately US\$ 0.15/kg or 20% lower than most European prices. In contrast to this, producer prices have generally been higher than comparable prices in Europe, at least since 1960. Since 1971 the producer price for milk has exceeded the consumer price, and subsidies have exceeded the costs of processing and marketing. Comparatively high producer prices have probably encouraged the entry of better operators into the industry and hastened the concentration effect discussed earlier.

The Government is the sole importer of meat in Israel, and through its control of this source of supply and through a policy of *assured prices* it controls the price of beef and reduces market uncertainties. The subsidies involved in this programme are, however, much smaller than those channelled to the milk market.

In addition to a price support policy the dairy industry has enjoyed, together with other agricultural activities, government assistance in capital outlays. Long-term credit was often supplied at nominal interest rates which were lower than the rate of inflation; that is, at negative real interest rates. The kibbutzim are better equipped to use such credit in large-scale investments. This is one of the reasons for the higher capital-labour ratio in this sector and, perhaps, also for the faster growth of the dairies in the kibbutzim in the 1970's when the accelerated rate of inflation made subsidised credit more attractive.

As indicated earlier, milk was in short supply in the first half of the 1950's. Less than 6% of the domestically produced milk was diverted to industrial uses (today this proportion is 60%), virtually all dairy products other than liquid milk were produced at that time from imported powdered milk and some powder was also reconstituted to form liquid milk. Butter and hard cheeses were imported when hard currency reserves permitted or when American food surpluses were available. The official policy was to encourage import substitution and self-sufficiency. This goal was achieved in 1960 and during the decade and a half that followed, imports were limited to closing seasonal gaps in supply or to meeting occasional shortages when planning goals were not fully realised.

As the milk supply expanded to saturate the market and to eliminate imports, the Government, unwilling to reduce producer prices, resorted in 1960, to a policy of production quotas. This development was not limited to the cattle industry; it was generally realised that, with increased productivity, a smaller number of farmers could adequately supply the Israeli market. Consequently, efforts to increase the rural population were discontinued and a policy of *agriculture for the farmers* restricting food production to rural areas was adopted. The first victims of this policy were the private urban cattle growers who were denied production quotas and their cows were bought up by the Government (see Table 21-2). Though at the time this was a much debated issue, it might well be that with rising land prices in the urban areas these milk producers would have eventually sold out anyhow.

Quotas were usually imposed, or reimposed after lifting, based on pre-quota production levels, but marginal changes were made in favour of the small family operators in the moshavim. In general, this policy succeeded in slowing the expansion of the larger producers but it did not succeed sufficiently in encouraging the small producer to increase his herd. In fact, milk production always fell short of the national quota allotment, with kibbutzim exceeding their quotas and moshavim failing to meet theirs. The extension service has recently recognised the difficulties of the small producer and is trying to intensify its efforts in this sector. Special credit is being allocated for this programme. It is, however, too early to assess whether or not it is having any success.

9. IMPLICATIONS FOR DEVELOPMENT

Israel has always suffered from a balance of payments deficit and a shortage of capital inflows to compensate for it. This problem has become more acute recently. Future government policies will have to be founded, sooner

or later, on balance of payment considerations more than on such *physical* criteria as maintaining the family farm or self-sufficiency in food supply. On this account the record of the dairy industry, relying heavily on imported feed grain, has always been weak. Substantial amounts of foreign currency could have been saved if part of the industrial demand for dairy products had been supplied by imported cheese, butter and powdered milk and the released resources diverted to lines of production that were economically more justifiable.

The situation today has reached the absurd stage in which the direct imports needed for the production of one kg of milk exceed in value the costs of the imported powdered milk and butter equivalent (which are low due to Common Market surpluses) that the domestically produced milk replaces. It is a reflection of the political power of milk producers that the government continues to support the dairy industry at its current level. It is difficult to predict how the industry would adjust to drastically lower prices and the necessity to reduce supply although on economic grounds such possibilities cannot be entirely discounted for the future.

10. ACKNOWLEDGEMENT

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