Chapter 6

Civilization Follows the Cow

In the early 1950s, the instinctive reaction to the problem of the hungry or malnourished child took one exclusive form: milk. The importance attached to its particular blend of animal fat and protein, vitamins and minerals, eclipsed all other solutions. In the Unicef mind, the virtues of milk could no more be questioned than the virtues of motherhood. In the eyes of both beneficiaries and supporters, Unicef remained for many years a kind of gigantic organizational udder, distributing a daily cup of safe, hygienic, nourishing milk to as many children in the world as possible.

When Unicef was created, its main purpose had been to provide extra rations for feeding hungry children in war-torn countries, and the axiomatic ingredient was skim milk in dried and reconstitutable form. Once the postwar crisis was past, the argument for keeping the organization alive had mainly hinged on the existence of hungry children all over the world, and it therefore continued to think about how to feed them health-giving foods.

Milk from a cow was not the most common or most obvious item of diet for children in many tropical countries. Unicef recognized this; yet for a long time it continued to regard the problem as one to be overcome by making milk more common and its virtues more obvious; or by doing the same for something as close to milk as nature and scientific invention would permit. Adulation for milk governed Unicef's attitude towards child nutrition in a profound and long-lasting way.

The science of milk conservation had made great progress in the first half of the twentieth century. In many milk-drinking parts of the industrialized world, milk drunk straight from a cow of uncertain health tethered in the backyard had been replaced by the pasteurized or otherwise hygienized contents of a bottle. The importance of milk in the infant's and child's diets were sacrosanct principles of nurturing; and this was the period when a synthetic formula based on cow's milk was believed by some paediatricians to be as good as human milk, if not better.

Changes in social behaviour, among them the emancipation of women, contributed to the move for sanitized milk and milk-based infant food products. Unicef itself, using whatever leverage it could wield through its own milk conservation programme, encouraged European governments to

establish 'a safe milk policy'; it also supported the manufacture of dried milk products for children's consumption. Safe liquid milk and powdered milk in a packet were, by definition, more expensive milk than milk from an udder in a stable; some countries subsidized the price through their milk marketing boards to be sure that safe milk would be within reach of poorer families. As public health regulations became more stringent, the dairies expanded, and as the number of urban consumers grew, the price would drop of its own accord, it was hoped.

The milk breakthrough with the biggest impact on Unicef's activities was the technology for roller-drying, and later for spray-drying, still a recent invention in the postwar world. Because these developments in dairy production allowed milk to be preserved and moved around without refrigeration, they held out the promise of a health bonanza even among children remote from any dairy cow. Skim milk contained all the same body-building elements as full cream milk, and since it was a residue from the production of expensive foods like cream, butter, and cheese, it was also very cheap. In the past, skim residues were usually fed to farm animals or thrown away; now they could be conserved, as could milk surpluses in the flush season. Unicef purchased nearly two million pounds of skim milk surplus from US stocks during 1949 and 1950, the years when the feeding schemes in European countries reached their peak.

After 1950, when Unicef began to concern itself almost entirely with children whose hunger and ill-health had less to do with the impact of cataclysmic emergency than to do with age-old rural poverty, it faced a very different set of nutritional circumstances. So much was made clear by the early surveys carried out in Asia and elsewhere, and by the international experience brought to Unicef by people of the calibre of Ludwik Rajchman, Berislav Borcic, Martha Eliot, and many others. But as Unicef moved into parts of the world not very familiar to its organizational culture, its mind still inevitably ran along lines developed during the period when most of its assistance went to Europe.

In the context of child feeding, the intimate connection between child health and milk was seen as universally valid, even if its universal applicability was impracticable for a number of reasons, not least the lack of cows and a dairy industry in most parts of the tropical world. Some compensation might be made by continuing to import skim milk for mother and child feeding programmes; but this strategy had inherent limitations. However cheaply milk surpluses could be procured from North America and elsewhere, no amount nor means of transhipment could make it reach all the hungry and malnourished children in need. Their numbers were one problem; but a much greater problem was that supplementary feeding required a high degree of organization and a functioning social network—schools, health institutions, community groups—which in many such countries was all but non-existent. A disease campaign team

might be able to arrive in a place and accomplish its mission in one visit, or in a series of occasional visits; supplementary feeding had to continue day in, day out, for weeks and months and maybe even years on end.

At the beginning of Unicef's new phase of existence, therefore, it was no more than realistic to envisage the use of skim milk powder as mainly confined to children and mothers in relief or refugee camps, orphanages or welfare institutions, and as a medicine for children showing clinical signs of severe malnutrition, either in hospital or maternal and child health care centres. But Unicef did allow itself to hope that, specially in countries which were economically further advanced, feeding programmes similar to those in European schools and health institutions could have a broader purpose. Wherever possible, milk powder distribution should be more than a hand-out; it should be a practical demonstration of the vital connection between nutrition and health. Its consumption should be accompanied by education about proteins and vitamins, which in time would foster new eating habits.

In Central and South America the policy appeared to pay off. The largest programme was in Brazil: it reached 500,000 children and mothers altogether, some through mother's clubs which promised to become mini 'milk co-operatives', purchasing a cow or a few goats to provide their own alternative source of dairy goodness. The supply of Unicef skim milk was popular in many American countries, and since the feeding schemes involved a wide variety of people—teachers, parents, community leaders, medical personnel—the idea of special meals for children began to catch on. Both Unicef and FAO were gratified when certain governments adopted child-feeding as part of public welfare policy.

Meanwhile, the prospects that cargoes of skim milk powder could make an equivalent dent in the fortunes of malnourished children appeared much bleaker on the other side of the world. Returning from a visit to Burma, India, Pakistan, and Thailand in 1951, Dick Heyward described himself as 'baffled and disappointed' by the lack of enthusiasm he had encountered among ministries of health for taking over full responsibility for child-feeding schemes currently supplied by Unicef. Malnutrition was an underlying, or direct, cause of so much ill-health among Asian children; and, with the important exception of India, most countries had more than enough food to meet their overall needs. Yet it seemed that, until the disease-control programmes had begun to roll back sickness from a different direction, scant attention or financial resources could be spared for organizing the nutritional protection of child health. This made it very important to try and find some alternative approaches. Quite what these should be in social and economic circumstances so different to those in Europe, and even than Latin America, was difficult to determine.

The plight of the hungry and malnourished child was then, and will always remain, the mainspring of international humanitarian compassion.

Yet of all the problems confronting the international organizations as they began to take their first steps in social and economic co-operation, less precise information was available about the nature of this problem than probably any other. Infant and child death rates in underdeveloped countries were known to be very high, maybe eight or twelve times those of industrialized countries, and it was assumed that a high proportion were caused by nutritional deficiency; but what proportion, among which children, and why, let alone what to do about it, were still largely a matter of conjecture.

During the course of the past twenty years, certain pioneering individuals had tried hard to gain for nutrition a prominent role within the field of international public health. One of these was Wallace Aykroyd, a British nutritionist who had served under Ludwik Rajchman in the League of Nations Health Section and had extensive experience in India. As head of FAO's Nutrition Division, Aykroyd now began to initiate moves at the highest levels of the UN system to make good the lack of a detailed scientific grasp on the worldwide child nutrition problem. In Unicef, his closest and keenest ally was Dick Heyward, who alongside his role as Maurice Pate's Deputy Director, began a life-long quest for solutions to what has turned out to be at one and the same time the most central, and most elusive, of all the problems of underdevelopment.

In the meantime, there was milk. After the supplementary feeding programmes in Europe began to close down, Unicef did not envisage a long continuing involvement in the mass movement of milk around the world. Events decreed otherwise. In 1953 the US Government made an offer that could not be refused: 100 million pounds of skim milk at a giveaway price. Unicef was guaranteed that this was not merely a sudden windfall which would not be repeated. Surplus milk would be available in quantity and on similar terms for several years to come, barring drought or other agricultural disaster. The following year, 1954, the US Congress passed Public Law 480, whereby various voluntary US overseas aid organizations were offered grain, milk and other surplus US farm produce free of charge from the port of exit. The amount of skim milk made available to Unicef was enough over the next few years to give a daily cup of milk to between two and four million children and nursing mothers. The cost of freight– the sole cost to Unicef– was less than two cents a pound.

Giving surplus milk to countries where milk was not an ordinary item of local diet was not without its critics. Nevin Scrimshaw, Director of INCAP in Guatemala City, was a strong exponent of the view that only foodstuffs locally grown and available in quantity were suitable for programmes meant to inform people about what caused malnutrition in children and provide them with long-term solutions. If people could not buy or 'grow' milk, they should not be encouraged to idolize its properties. Unicef disagreed. It believed in milk as an advertisement for the values of nutri-

tion as a principle. US food generosity appeared to offer the prospect of doing something not merely instantly charitable and humanitarian, but useful over a longer period; it offered a gratuitous extension to the period during which, it was hoped, the epidemiology of malnutrition would become better understood and some new preventive and therapeutic solutions materialize which were not so inextricably connected with the output of the dairy cow.

While Unicef shippers and programme staff in countries such as Korea, Japan, India, Brazil, Pakistan, Israel, Jordan and many others continued to grapple with barrels and kegs of powdered milk from milk-surplus USA, its 'milkmen' continued to look at 'indigenous' sources of milk. Unicef's milk conservation programme had been set up to provide the dairy industries in war-torn Europe with the odd critical piece of equipment which would speed up its development in such a way as to get more milk more quickly into more under-sized children.

This programme continued in operation throughout the 1950s in Greece, Italy, Yugoslavia and many other European countries, mostly those around the northern and eastern shores of the Mediterranean where the development of the dairy industry lagged behind that in more northerly climes. Not only did Unicef help equip plants and liquid milk factories; it also helped pay the training costs for dairymen and dairy managers. A new phase of the programme opened towards the end of the decade, when Spain joined the list of recipients and when certain countries in eastern Europe – including Poland and Bulgaria – revived their postwar interest in receiving dairying and other assistance from Unicef.

By 1960, Unicef had provided over 150 milk processing plants to European dairies; some help continued until nearly the end of the decade. The overall effect of this effort was as important in its policy as its practical implications. In many countries, the authorities became – at least partly because of Unicef's influence – so convinced of the permanent health advantages of boosting milk consumption that such measures were enshrined in national policy, and the plants helped by Unicef a ready source of cheap nutritional goodness.

Unicef's new orientation towards the countries in less developed regions of the world did not initially appear to hold out any such milk conservation opportunity. The outlook for replacing imported skim milk powder given to schools and health centres with the contents of a bottle milked from a local cow and processed in a local dairy plant appeared extremely limited.

It was widely assumed that the cow's udder – even where its contents were a regular item of local diet – could only become the basis of a dairy industry in a temperate zone. Many tropical countries had their own cows and cattle breeds; but they bore little relation to the Jerseys and Holsteins chewing the cud in the clover fields of Europe and North America. They were tough and hardy, suited mainly to draught and burden, for which

they were principally bred; they gave little milk, and in a hot climate such little they did give was highly perishable. A dairy industry is a sophisticated industry, requiring scientific breeding, pasturing, stabling and sanitary milking methods; also elaborate and dependable systems of milk collection, cooling, pasteurization, packaging, distribution and sales. In most of the countries outside Europe where the Unicef milk team and their FAO advisors now began to set foot, such dairy industries as existed only produced luxury foods for a tiny élite.

The most hopeful prospect was in the Americas. Scrimshaw's protests to Unicef about the use of imported skim milk as the basis for nutrition programmes had an unquestionable validity unless a local supply could be developed as the future substitute. On an exploratory visit to Central America and Brazil in 1951, Don Sabin and Dr Joseph Edwards, an FAO expert from Britain's Milk Marketing Board, found that government leaders, thanks to Unicef, had become greatly impressed by the alchemy performed by the dairy cow on a mangerful of such unpromising materials as herbage, straw and oil seed residues. In Costa Rica, at a meeting attended by no less than four Ministers and the President of the National Bank, the Minister of Public Health solemnly declared: 'It is remarkable what a glass of milk can do. The Unicef child-feeding programme has been responsible not only for starting the milk-drinking habit among children, but for bringing together, for the first time, the many interests in the country which are bound to be concerned in the establishment of a permanent milk policy'.

In his report on this visit, Joseph Edwards, commented with homely wisdom that 'civilization follows the cow'; there seemed to be more promising signs about the possibility of setting up dairy industries in less developed regions than had previously been envisaged. Edwards explained his philosophy: 'Compared with single-crop farming which exhausts the soil, dairy farming, properly encouraged and organized, can make an immense contribution to the health of children, while at the same time enriching the countryside'. The indications in Central America were that, as in Europe, milk's connection with child health would soon become an established part of national consciousness, and that local resources would carry on what schemes assisted by Unicef had begun.

Soon afterwards, Unicef agreed to provide equipment for dairy plants in Brazil, Chile, Nicaragua and Ecuador. These were experimental ventures: the intention was that each plant would serve as a test and a demonstration in its country of the viability of dairy enterprise. As always in the case of Unicef's involvement in milk conservation, the agreements stipulated that part of the plants' output was to be used for child feeding, to the value of one-and-a-half times Unicef's contribution. These agreements sparked requests from elsewhere in Latin America; by 1955, Unicef had committed support to eleven dairy factories in the continent.

There was also a country in Asia, a very large country with a very large

number of hungry children, where there was an indigenous supply of milk and the beginnings of a dairy industry: India. Perhaps, in India at least, the problem of promoting the use of milk in supplementary child feeding in the hungriest part of the world might not prove so 'baffling and disappointing' after all.

In the early 1950s, India contained one-third of the world's cattle and half the world's buffaloes—one milkable bovine for every six people. Milk, fresh or soured, and *ghee*—clarified butter—played an important part in the traditional Indian diet; they were the only form of animal protein permitted under the strict rules of Hindu diet. The cow was seen as so benificent a beast that Indians treated it as holy, never slaughtering one past its prime but letting it loose to wander around and feed where it might. In the countryside, a farming family often kept a cow, mostly for breeding animals for ploughing and draught, and sold whatever tiny milk surplus was left after meeting the family's needs. In the cities, milch animals were kept as a business. Milk was a popular food, and there was plenty of room for improved dairying. The milk yield of the average Indian cow was one-twentieth that of an exotic breed—and that of the average buffalo, one-tenth.

Bombay is an island city. In the mid-1940s, its growing population was beginning to burst its seams. Anxiety about poor public health was exacerbated by the presence in the city of a large bovine population and the uncontrolled sale of dirty and adulterated milk. Urban construction had swallowed the local pastureland, and the owners of the city's milk buffaloes kept their animals in common stables whose squalor was of Augean dimensions. The stalls contained many hundreds of animals; each stall was constantly awash with ordure, and each animal's owner or his lessee guarded his charge from a hammock swung above. He sold his milk from house to house, carrying a wooden yoke around his neck from which dangled two open brass pitchers. The milk was a sea of bacteria and customers routinely boiled it. A Unicef document of the time modestly described these conditions of milk production and distribution as 'lacking in elements of hygienic control'.

In 1946, D. N. Khurody, the Milk Commissioner of Bombay, began to put into place elements of the kind of 'safe milk policy' Unicef was soon to champion in Europe. Restaurants and hotels were bound by law to use only imported skim milk powder, sold to them at a profit by the government. With the proceeds, Khurody realized a new concept in Indian dairying: a buffalo colony.

Cowsheds were laid out in acres of rolling parkland twenty miles away at Aarey, and buffalo owners were enticed into exiling their beasts to a new and sanitary existence. For a small monthly licence fee, the owner received

stabling, breeding services and accommodation, and contracted to sell all the animal's output to the State government at agreed rates and standards of quality. The supply of milk from Aarey allowed Khurody to implement the other part of his milk scheme: the high-fat buffalo milk was 'toned' with water and skim milk powder to produce a milk as rich as cow's but saleable at half the price. Not only did this make cheaper milk available to more city people, but it provided a free supply for the schools. A survey had revealed that a quarter of Bombay's school children were badly undernourished, and blamed the lack of milk in their diet. By the early 1950s, 40,000 of them drank a daily cup of 'toned' Aarey milk.

By 1953, when the first emissaries from Unicef arrived to discuss dairying with Khurody, Aarey colony had become the showpiece home of 15,000 buffaloes and a regular tourist spot where the unlikely sight of calves being washed and combed among the flower gardens never failed to impress international visitors. Glan Davies, a Welshman recruited by Sam Keeny as his lieutenant in India, was looking for an opportunity to use skim milk to promote dairying. Khurody's milk scheme, the forerunner of others in India, was already a recipient of Unicef milk supplies. Davies was accompanied by Don Sabin and another milk conservation colleague, Ronald Hill. To begin with, discussions centred on Unicef's offer of new pasteurization and bottling equipment for Aarey, about to receive a new influx of buffaloes from the stews of bovine Bombay; but as other aspects of the city milk set-up were revealed, a more ambitious and more risky suggestion materialized.

The Unicef group was introduced to Verghese Kurien, the manager of a co-operative dairy union based at Anand, 260 miles to the north, where local farmers had long been producing milk for sale to Bombay. The milk co-operative, out in the countryside, was currently facing expansion problems directly connected to the Aarey buffalo colony's increasing milk output. Davies, Sabin, and Hill decided to extend their trip up-country. They took the train to what seemed like the most unprepossessing outpost of dairy enterprise, were impressed by Kurien and what he showed them, and thereupon embarked on what became one of Unicef's proudest partnerships. In time, Anand became a national and international byword for success in both tropical dairying and transforming the lives of the rural poor.

Anand was in Kaira District – a large, flat and fertile plain whose one-and-a-half million people depended entirely on farming. Each family kept a buffalo or two, and milk was a modest cottage industry. When Bombay's Milk Scheme was launched, the city's demand for milk from Kaira rapidly increased; but because of the perishability of their product, the small producers found themselves at the mercy of private contractors who bought and processed their milk and sent it to Bombay, pocketing the proceeds. In order to cut out the middlemen, the farmers in certain villages

formed co-operative societies in January 1946; within a year, the societies formed a union. One of the most important elements in their success was the backing they had from prominent Gandhians and some key political figures, one of whom was V. Patel, shortly to become India's first deputy Prime Minister. Verghese Kurien, a young engineer with training in dairy management, was appointed as the co-operative union's manager in 1950. By this time, it had a small pasteurizing plant in Anand. Under Kurien's leadership, the union embarked on a process of rapid expansion.

Kurien had a visionary approach to the development of the dairy industry in India. He was inspired not by the idea of large gleaming milk factories in the cities and colonies of thousands of buffaloes ranged neatly in organized cowsheds, but of an industry based upon the tiny rural homestead, with the cow or buffalo in the family compound yielding every day to the fingers of the womenfolk no more milk than would fill a small brass pot.

The difficulties of collecting thousands of tiny amounts in a countryside with few roads and a fierce climate would have appeared insuperable to most dairy enthusiasts. But Kurien abandoned preconceived ideas about the conventional basis of dairy farming elsewhere in the world: the herd of cows, its collective pasturing and milking requirements, the quantities it produced which went en masse for processing and sale. That was not the pattern of milk production in the Indian countryside nor was it likely soon to become so. The main markets for milk were certainly in the cities; to Kurien the problem therefore became one of connecting the brass pot of milk in the village homestead with its urban customer. Modern cooling and conservation techniques seemed to offer the necessary connecting rod. The suburban buffalo colony might be a suitable means of keeping animals off the streets, with the added advantage of keeping the milk supply close to the city and therefore easier to keep fresh; but the cost of bringing in fodder from the countryside and taking cow-dung back to it was too high to make the milk economic.

The owners of most of the nation's bovines and the producers of more than half its milk were also the nation's poorest people: the small farmers and the landless. A fair price for their milk would still keep it cheap for the consumer, and if they could be inspired to feed their animals better and improve their yields, their own livelihood and the state of their children would be transformed.

By 1953, when Kurien first set out his ideas to Davies and Sabin, the Kaira District Co-operative Milk Producers' Union at Anand consisted of fifty-eight village societies, 10,600 member-farmers with 23,000 buffaloes, and milk collection centres in eighty villages. The State government had begun to construct 'milk collection roads' to link up with an all-weather highway passing through Anand, and had given grants for schemes to improve pasture, install water pumps, construct hygienic cattle standings,

and offer veterinary and breeding services.

Among farming families there was a marked rise in living standards, health, and children's welfare. But the union's growth had reached an impasse: its own treatment plant was small, and Bombay could no longer guarantee to accept the 8000 gallons of milk being sent down by train from Anand every day. Countryside was competing with city, and the city was winning. With no alternative sales outlet, Kurien had been forced to introduce a system of denying a market to different village societies on rotation. At the season that their buffaloes were most productive, the village societies suddenly found themselves making a loss.

Kurien wanted the fortunes of the co-operative union to become less dependent on the whims of Bombay city milk drinkers and the handling capacity of the city dairies. The means he proposed for reversing the situation were audacious: a modern dairy plant right in the heart of traditional India.

He invited Unicef and FAO to join the New Zealand Government– offering assistance under the Colombo Plan– to become founder investors. Alongside a plant for the production of tinned butter and *ghee*, Kurien wanted a plant for spray-drying the residues into a buffalo skim milk powder: just the kind of machinery in which Unicef had appropriate expertise. The milk powder produced at Anand would be used to 'tone' buffalo milk, and thereby increase the volume of cheap, safe milk available to low-income families. No-one had ever previously attempted to dry buffalo milk; fortunately, its unusually high-fat content did not resist the process as some had feared it might. Once Don Sabin had satisfied himself that the enterprise was technically sound, Unicef agreed to supply the necessary equipment. Unicef's first assistance for milk conservation in India thereby linked a pasteurizing plant for Aarey with a spray-drying plant for Anand, and added a refrigeration plant in Bombay for preserving milk from both. As always, a pre-condition of support was free milk to more than its value for children both in Kaira district and Bombay.

At that time, Unicef's support for Kurien's dairy enterprise seemed a brave leap of faith. It was hard to picture that such a seemingly humble operation as that at Anand, whose only obvious assets were the flair and dedication of its leaders, had the organizational capacity or the financial backing to purchase land, erect buildings, install water supplies and electricity, hire and train dairy staff.

The leap of faith proved amply justified. The foundation stone of the dairy plant was laid in November 1954, and on 31 October 1955, Prime Minister Jawaharlal Nehru himself declared the new factory officially open. Anand could boast the largest dairy complex of its kind in India, including the first spray-drying plant for buffalo milk in the world. The most impressive feature of the factory was, however, not what it was but where it was and whose direct interests it served. Every day, thousands of

men, women and children of all castes and creeds queued up with their pots at the village milk collection stations; their milk was measured and checked for its fat content, and they received cash on the nail. For these rural people of India, this represented a transformation in their lives.

The installation of the new dairy plant at Anand had far reaching consequences. Within five years, the co-operative union had expanded its membership to 40,500 village societies. The increased output of the hundreds of thousands of buffaloes supplying Anand meant that, between its own factory and the quantity still contracted to Bombay, the co-operative soon had a milk surplus once again. Between 1958 and 1960, Anand opened up more plants, to produce sweetened condensed milk, baby food—and another world 'first': buffalo cheese. The Kaira Union adopted the brand name Amul—Anand Milk Union Ltd—for all its products; 'amul' means 'priceless' in Sanskrit, and the label began to earn a reputation throughout India for top-quality dairy goods.

A few years later, on the basis of a grant from Oxfam and food wastes provided by the World Food Programme, a plant for cheap buffalo feed was opened; the local buffaloes soon began to yield 1000 litres of milk a year, more than twice the national average. By this stage, Anand had become not only a brand leader in dairy products, but a training centre for dairy management and a test tube for the expanding dairy industry not only in the region, but the country as a whole.

In the late 1950s, the Indian Government embarked on a nationwide city dairy upgrade to increase milk supplies for urban consumers. Unicef was an enthusiastic supporter. During the course of these years, assistance was extended to dairies in Rajkot, Ahmedabad, Bangalore, Calcutta, Kanpur, Hyderabad, Madurai, and others. The largest dairy Unicef helped to build was at Worli, near Bombay. In spite of its large, industrial nature, Unicef gave $1·5 million altogether towards the construction of Worli dairy, mainly out of loyalty to Khurody whose imaginative policies—buffalo colonies, the use of cheap or free imported skim milk to 'tone' milk and reduce the price permitting welfare and school distribution—had done so much to pave the way for improving the supply and quality of milk in urban India, and to promote the health of mothers and children. By 1965, Unicef had spent $7·4 million on milk conservation in India for thirteen milk plants and five dairy training institutes.

The rural milk producer co-operative at Anand was something of an anomaly in the regular pattern of Unicef assistance for milk conservation, which had a natural tendency to be city-bound. Unlike Verghese Kurien, whose primary target was the rural poor and who viewed the milk of their buffaloes as a means of transforming their livelihoods, Unicef was exclusively interested in milk production as a necessary precondition of its consumption by underfed children.

The basic assumption of the time was that the countryside looked after

its own milk needs. In the city, milk was only available from a vendor, not 'free' from a cow tethered in the yard. City milk was not only a more costly food item, but also much more likely to be hazardous to health—unless, of course, it came from a clean dairy and had been sealed into a hygienic bottle. In the city, too, unlike in the countryside, there were schools, hospitals and large congregations of palpably-needy people, which meant that it was easier to find a means of reaching the Unicef customer.

In the early years of Unicef's milk-conservation experience in countries outside Europe, efforts to put more clean cows into milking stalls, more clean milk onto city streets, and more free milk into under-fed children were thought to be as significant as any transformation in rural well-being brought about by forming prosperous milk producer co-operatives. For some time there was a school of thought—fostered by some of FAO's leading nutritionists—which went so far as to believe that no dairy plant should be set up in a rural milk-producing area. Those of this persuasion were sceptical of Kurien's ideas and even found it indecent for Anand's factories to exploit the local buffaloes so efficiently; they held that the children of Kaira's farmers were actually being deprived of their 'free' source of milk. Khurody's milk scheme in Bombay, which not only fed children in school but which sold cheap, subsidized milk at kiosks in the city slums, was much more typical of the kind of welfare scheme visiting experts recognized from their European experience.

The Kaira milk union was a private enterprise; the Bombay milk scheme was run by the city authorities as a public welfare programme with an overtly humanitarian purpose. In Asia it was pioneering a policy of 'milk for the people', and it deserved the support and admiration it inspired. But its importance as a model was over-emphasized, partly because of the wishful thinking of its admirers, who attached a halo to any successful scheme distributing subsidized milk to the needy in the adverse social and economic circumstances of a country such as India.

Those who distrusted the nutritional benefits of the Kurien approach were in time roundly disabused. In Kaira district, the buffalo-owning families' milk consumption did not fall as their business boomed; it increased. Unicef's assistance had been provided with the usual strings attached: milk to one-and-a-half times the value of the plant was to be distributed to children free. The village societies set up their own feeding schemes, handing out rations every day at the milk collection stations.

This programme peaked in 1959, when more than 12,000 children received a daily cupful. Nutritional criticism of Kurien's approach had derived from nothing more scientific than the deep suspicions often aroused by the spectacle of commercial success in purveyors of humanitarian blessings. Time was to show that Kurien's marriage between the people's well-being and a profitable dairy enterprise was a much less awkward

affair than the version Unicef and its milk-conservation partners mostly tried to bolster.

By 1959, after several years of milk-conservation experience outside Europe, Unicef's involvement in dairying had expanded way beyond the narrow welfare base of its original intention.

At the end of the decade, Unicef invited its technical partner, FAO, to analyze the results of its milk conservation projects in Central and South America, the eastern Mediterranean and in Asia. Not only was it important to find out whether the investment had directly helped mothers and children by trying to count the heads of those who had drunk the milk; but as Unicef had found itself plunging rather more deeply into other aspects of the dairy business than the local supply of milk for supplementary feeding, it wanted to consider the implications thoroughly.

FAO and Unicef had advanced the civilizing mission of the cow together. FAO's advisors had offered technical expertise about everything to do with dairy farming and management: fodder, breeding, pasturing, protection from disease, and other elements of care for the cow; as well as milk quality, pricing, collection, processing and marketing. Unicef's role was, initially at least, conceptually modest, even if financially more significant. It provided the equipment needed to secure a supply of safe milk for welfare programmes, and some training in how to run and manage it; its dairy engineers merely advised on the donated equipment's specifications and installation. However, in countries whose dairy industry was at best embryonic, the Unicef milkmen either had to do more than this or nothing at all. No longer could milk conservation assistance simply consist of supplying missing pieces in an all but fully-fledged operation; it had to help set up the whole affair. A pasteurization or drying plant, carefully selected, immaculately installed, could do nothing for child nutrition on its own. Self-evident though this was, how seriously deficient some countries would turn out to be in the various essentials for a dairy industry, let alone one that could inculcate the habit of milk-drinking among children, came as quite a shock to both Unicef and FAO.

By 1959, after some false starts and other delays at various project sites, a survey technique had been elaborated to eliminate all candidates for dairying help whose proposed processing plant would be a hopelessly uneconomic proposition. For the time being, this almost automatically included any drying plant: while huge stocks of free surplus skim milk continued to be available from North America, no drying plant set up to conserve a country's or locality's surplus—'surplus' being a misnomer anyway except in the flush season—could possibly compete. In fact, FAO's consultants suggested that it would be a good idea if more dairies would use the imported supplies in the way employed at Aarey—either for

'toning' very rich milk, or 'standardizing' full cream cow's milk to reduce the fat content and subsidize the sale of cheaper milk or its free distribution.

While it was unrealistic to judge many of the new dairies by regular standards of economic efficiency, the fact was that, in order to subsidize mother and child welfare (not just during their period of obligation to Unicef, but on a continuing basis, which was after all the ultimate purpose of helping them in the first place), they did have to become economically viable as quickly as possible. The only way this would happen was to help the dairies gather in a plentiful supply of cheap milk.

Careful cross-breeding would help fill the udders of animals whose primary purpose in the existing rural economy was burden or beef. That the existing milk-yielding cows in tropical places had a different genetic make-up from relations in temperate zones was not a surprise; but this was now seen as relatively insignificant. FAO's consultants were much more dismayed to discover that the cows' human minders had not the smallest notion of making hay or otherwise growing and conserving fodder. The same cow, unreconstructed from a biological point of view, might produce more milk if given more to eat; but such food would have to be grown or bought.

These were not familiar notions to many farmers in the new pastures in which FAO and Unicef were grazing. They quickly became familiar to the farmer and his wife if a good price was given for the milk their animals produced: the existence of a new dairy did appear to exert some pulling power of increasing milk production in the countryside nearby. But the price often remained relatively high from the dairy's point of view; only much increased volume would bring it down, and that in turn depended on better animal husbandry. Until the price of raw milk fell, the price of processed milk to the consumer stayed correspondingly high, and the cost of welfare distribution too prohibitive to be attractive to governments over the longer term.

At this stage, although a number of plants had been authorized for American, Indian and Middle Eastern destinations, only a handful—Aarey, Anand, drying plants in Nicaragua and Costa Rica, fluid plants in Iran, Israel, and Turkey—were yet in operation. Unicef did not now take fright at the risky nature of its milk conservation investment. It accepted the implications of trying to help provide milk in much more difficult surroundings, and broadened its policy accordingly. If agricultural extension services were needed in rural areas to put more food into the cow, Unicef was willing to assist; if skills and expertise in dairy management were needed to put the milk business onto a sounder basis, then Unicef would help fund further fellowships and training. Only at organized cross-breeding did Unicef draw the line. The purpose of its milk conservation policy was still to ensure a good supply of cheap milk for undernourished children and

mothers but, if certain things had to be done to reach the ultimate goal, then so be it. The civilizing mission of the cow was too important to hold back.

Throughout the 1950s, Unicef continued to ship large quantities of US surplus skim milk around the world. The peak came in 1957, when 4·5 million children and pregnant and nursing mothers—mostly in Asia—were provided regularly with rations either in schools or in health facilities. This number represented a small proportion of those in need; nevertheless it not only gave direct nutritional help to some of those who needed it, but did so in a way that satisfied the international humanitarian impulse to put the world's surplus food to good use.

In places where the output of new dairy plants was expected soon to take its place, the skim milk was also seen as a useful stop-gap; elsewhere, it was hoped, it would at least have an educational side benefit. Meanwhile, every effort was made to develop a better-informed grasp of the scale and nature of the nutritional difficulties facing children around the world.

Early in the decade, the world's leading nutritionists narrowed down the field of malnutrition's victims and identified the chief dietetic culprit. Of great influence on contemporary thinking were the results of a nutritional exploration of the African continent undertaken by Professor J. F. Brock of the University of Cape Town and Marcel Autret, Aykroyd's deputy and, later, successor in FAO's Nutrition Division. Their report, published by WHO in 1952, focussed on 'kwashiorkor'. the condition in young children first described in 1930 by a British physician, Dr Cicely Williams, in the Gold Coast. Roughly translated, kwashiorkor meant 'the disease of the child deposed from the breast'; its victim was the child forced to make too sudden a transition from breast-milk to an adult diet because of the mother's next pregnancy. The condition was a relatively recent phenomenon in Africa; until missionaries inveighed against the practice of polygamy, lengthy spacing between child-bearing was an in-built feature of traditional family life and marriage custom.

Brock and Autret found that kwashiorkor was almost unknown among the children of cattle herders whose diet included milk and meat, and unusual among farming peoples whose staple food included grains and vegetables with a high-protein content. It mostly affected the children of peoples whose regular cuisine relied on starchy grains and tubers, particularly cassava which well deserved its reputation as a 'famine crop': it grew easily, plentifully, in poor soil, with little rain; but it was all bulk and almost no nutritional goodness. Kwashiorkor's symptoms were listlessness, swollen limbs and stomach, and reddish patches in skin and hair, which in time gave way to the unmistakable symptoms of frank starvation. Here was a specific, clinically definable, malnutrition 'disease' which illustrated vividly

what happened when a small child was given no special regimen during the crucial period between the ages of six months and three years to compensate for the abrupt and definitive loss of proteins and other nutrients in breast-milk.

Although etymologically the disease belonged to Africa, in the early 1950s kwashiorkor came into wide use as a term describing similar manifestations of protein deficiency 'disease' in children all over the world. Research at medical and scientific research institutes in Asia and Latin America consistently confirmed that kwashiorkor in young children was a much more widespread public-health problem than previously realized, and was a contributing if not the clinically specified cause of death in many young children.

The growth and health of many others whose sickness was never caught in the medical searchlight was hindered by a lack of body-building proteins at an early age, sometimes permanently. Other ingredients required by the small body – vitamins A, D, B_1, and elements like iron whose absence was often responsible for anaemia in the mother and frailty in the newborn baby – also needed special attention; but the threat to health caused by the lack of protein in the younger child outclassed all other concerns. Filling this 'protein gap' became for a while the overwhelming nutritional preoccupation.

Pinpointing the target – children in the age group between one and four years old – ought theoretically to have made the task of the food and nutrition policy-makers very much simpler. It actually did the reverse, for of all children this group was the hardest to reach. However thin the spread of health facilities and schools in certain countries and regions, at least some proportion of babies and school-age children could be found in clinics and classrooms. The only specific place to find the in-betweens was in the kindergarten or nursery school; but outside the industrialized world this was a very rare institution, and where it did exist was attended almost exclusively by the well-fed child of well-educated city parents.

There were few obvious alternative routes to the small child in the rural home, the child of the mother whose knowledge of food values and the symptoms of nutritional deficiency was marginal or governed by dietary taboos or plain ignorance. Gradually, this predicament forced the nutrition fraternity to rethink their strategies. The supplementary feeding programme – the mass welfare approach – was no use in the absence of an institutional framework.

During the second half of the 1950s, strenuous efforts were made to try and reduce the proportion of Unicef skim milk given out in school lunch programmes, and increase the amount distributed to mothers attending health clinics to feed to their younger children. Even if this re-orientation only touched the edge of the problem, it was the only choice. Other than hoping for, and doing their best to support, more rapid 'infrastructural

development'—more maternal and child health centres, more kindergartens, more women's clubs—Unicef and its partners in the skim milk distribution business were at a loss. At least, they comforted themselves, the programmes that did exist offered an opportunity for implanting ideas about sound child nutrition, ideas whose obvious merit must appeal.

Unfortunately, nutrition education was not always such a convincing benefit among those it was most supposed to impress. Busy health staff had little time to give instruction, and mothers with squawling infants were short of the patience and concentration needed to take the information in. The typical nutrition talk and flip chart usually bunched foods into scientific groups and extolled the protein content of milk, meat, fish and eggs, and the delights of vitamins and other elements in vegetables and fruits. Even if such notions were comprehensible, the fact was that in most parts of the world, these were luxury ingredients consumed irregularly or only on celebratory occasions, and rarely by children. It was difficult enough to put across the idea that the scoop of skim milk powder, carried home in the bowl the mother had brought for the purpose, was to be made up carefully and fed to her younger children and herself. Whatever anyone told her to do, she would make a decision dependent on fuel, utensils and cooking amenities, and this might well be to add the powder to the family pot. Skim milk could not be the force that would change the cooking and eating arrangements of poor and ignorant mothers to suit the requirements of the small child, especially if these were portrayed according to classic patterns of western nutritional predilection. For most such mothers, skim milk rations could only be skim milk rations, and if they ended, the average mother could not or would not replace them with some other protein-rich equivalent.

Part of the problem, especially in milkless zones, had to be that no such equivalent existed. So, at least, the nutritionists reasoned. The narrowing focus onto protein begged an obvious question: where milk could not fill the 'protein gap', what was the alternative? In certain countries of the developing world, no amount of optimism could colour the forecast for the dairy industry; cows and buffaloes were simply too thin on the ground, and short of a meteorological miracle, were likely to remain so for several generations.

A substitute for milk was needed, something which could be easily and cheaply produced, nourishing, digestible and palatable enough to command dietary fashion. There were a number of vegetable sources of protein: the beans and peas of the pulse family offering a specially rich supply. Many foods had crossed oceans from other continents—maize, potatoes, sugar, spices—to become part of the regular diet in an immigrant location; changing basic food habits was not a rare historical phenomenon, quite the contrary. It was not a quick nor an easy process to get a new food crop widely grown and accepted; the agriculturalists, educators, nutritionists,

and paediatricians would have to join forces to make the foods well-liked and acceptable. With more and better nutrition education, more and better training for nutrition educators, food habits and culinary practice could—must—change in time.

Although cereal and legume proteins were still regarded very much as poor relations to proteins from the animal kingdom, recent experiments had shown that careful combinations of beans, peas and seeds could compensate for their individual deficiencies. In an age when food processing technology was altering what was eaten in which season by people all over the industrialized world, it was a small jump from the idea of processing and conserving milk for protecting children's health to the idea of processing combinations of vegetables and doing the same with the result.

R. F. A. Dean, a British nutritionist, had used a combination of barley, wheat and soy, malted together and spray-dried, as a supplementary food for malnourished children in postwar Germany; with ten per cent of skim milk added, the children had done very well. Already in 1950, Don Sabin in Unicef had begun to dream of equipping nondairy 'milk' factories to turn out white, creamy, vegetable liquids as a substitute. In an age when new technology was being applied so successfully to public health, it could surely be enlisted to blend peas and beans into cheap and nutritious foods to conquer widescale protein deficiency 'disease' in children. Thus began a nutritional Jules Verne period, a futuristic vision of harnessing food technology to conquer hunger, a vision to which at the time only a few cynics remained immune.

The closest approximation in the vegetable world to the magic of milk was the humble soya bean. In several eastern Asian countries, the soya bean—fermented, turned into a curd or a sauce, or eaten just after sprouting—was a familiar item of diet. By the 1950s, its possibilities as a milk substitute had already been analyzed quite extensively. The first soya milk 'dairy' was set up in Shanghai in the 1920s, and successor products, enriched with vitamins, were sufficiently successful to be sold in the US and Europe for infants allergic to cow's milk.

In Indonesia, cow's milk was virtually unobtainable and there was no foreseeable prospect of establishing a dairy industry. In the early 1950s the Indonesian Government requested UN advice on their national nutrition programme, and decided to act on the suggestion that a locally-manufactured soya milk might serve as a health-giving, body-building weaning food. In 1953, on the technical advice of FAO, the Indonesian authorities began construction of a $2·7 million factory in Jogjakarta for the production of 'saridele', a powdered soya milk. Unicef contributed $543,000. The enterprise had great appeal to food scientists and laymen alike, for 'saridele' appeared to hold out the promise of a child nutrition

breakthrough for other countries where soya was already widely grown, or might without difficulty be introduced.

Unicef made one other early foray into the experimental manufacture of a milk substitute. In 1955, after three years of trials carried out with help from FAO, Unicef lent its support to the construction of a small fish-flour factory in the Chilean town of Quintero. As a source of protein, fish ranked very high in the nondairy pecking order, but, like milk, fish quickly lost its appeal in a hot climate; even smoked and salted it did not keep well. There were many countries around the world with a seaboard and a fishing industry where fish were underutilized as an item of local diet. The good fish went for export and landed up in cans on the larder shelves of Europe and North America; the lower class fish, pungent and strong-tasting, were ground into fishmeal and sold as a fertilizer or a feed for farm animals. To make fish a suitable supplement for children, it needed careful processing. Fishmeal, while extremely cheap and highly nutritious, was regarded as unfit for human consumption.

Chile had an interminable coast and a surplus catch both of lean white fish and of the less palatable variety. The pilot plant at Quintero was therefore regarded as the ideal laboratory for similar enterprises elsewhere. In the season when there was surplus white fish, the plant would process it into powder; at other times it would deodorize and deflavourize fishmeal and 'flour' it instead. The results of the initial runs of both these substances were fully field-tested and found acceptable when mixed with other ingredients; since its protein content was at least seventy per cent, only a tiny amount was needed as a daily nutritional booster and the cost of adding it to primary school lunches was estimated at between twenty-five and fifty cents per child per year.

In the mid-1950s, the persistent efforts of a growing band of international devotees began to pay off; an explosion of excitement began to develop around the idea of processing locally-produced vegetable or piscine ingredients into milk's brave new alternatives. One group of ingredients had begun to take on a special allure: the by-products of the edible oil industry. Once the oil had been extracted from soya beans, coconuts, cottonseed, peanuts, sesame seeds and sunflowers, a 'cake' full of good quality protein remained. These presscakes were the world's cheapest supply of edible protein: like skim milk, they were a residue and, like skim milk before the invention of drying techniques, they were commonly fed to livestock. But unlike skim milk, their 'starting material'– the nut, bean or seed itself– was much less prejudiced by a hot sun and other hazards endured by the dairy cow in tropical climates; many oilseed crops thrived in the very parts of the world where protein deficiency in the preschool child was such a problem. Here was a foodstuff even less well utilized than fish in filling the 'protein gap', and certainly far cheaper than flour made from white fish or milk made from soya.

In 1955, the leading medical and nonmedical experts in food technology and nutritional science gathered for what turned out to be a landmark conference, sponsored by WHO and FAO. The chairman was Dr Charles Glen King, a leading US nutritionist whose enthusiasm for commandeering all conceivable goodness from plants and cowcakes on behalf of children was enhanced by a recent tour of Central American countries undertaken on behalf of Unicef. King was particularly impressed by Scrimshaw's work at INCAP, both in charting the problem of child nutrition and in pioneering the use of locally-grown vegetable protein as a solution.

The conference, held at Princeton University, opened a new phase in the working relationships on the child nutrition problem between FAO, WHO, and Unicef, and led to an international programme for food products research and testing, carried out by institutes, laboratories and university departments around the world. The purpose was to exploit cheap, locally-available sources of protein to develop prototype foods for mass production by the food industry and mass consumption by the malnourished child.

Any new food product intended for the consumption of infants and young children had to be thoroughly tested to ascertain its chemical composition and biological value. WHO set up a special Protein Advisory Group (PAG) of four nutritionists and paediatricians to advise on tests and testing methods; in time this group expanded its interests across the whole range of protein and other child nutrition problems, but its genesis was the processing of fishmeal and oilseeds into flours for filling the 'protein gap'.

The Rockefeller Foundation was the research programme's main donor, providing $550,000 in grants for tests carried out in various institutes. These funds were administered through the Committee on Protein Malnutrition of the US National Research Council, some of whose members were also members of the PAG. Unicef added $300,000, mainly to cover the costs of buying or making pilot batches of food products for testing on animals, and later, under controlled medical supervision, on humans. The foods' preservative qualities in hot climates also had to be discovered, as well as that vital and fickle element: their acceptability to the human palate. The programme became gradually more refined, eliminating products which could not be easily grown or caught in a net, or whose processing was complex or uneconomic.

By 1959, twenty-two investigators in thirteen countries had carried out laboratory and clinical testing of milks, flours and pastes, and the future weaning foodstuff field had been thoroughly surveyed. The ground was mapped geographically, biologically and technologically: when complete, the comprehensive body of knowledge it produced was supposed to enable an appropriate machine to be installed anywhere in the world to make the essential link between the local pulse, sardine, peanut and person. Technically, the programme's results were excellent. It was conclusively proved that many different nondairy mixtures could cure or prevent kwashiorkor

in young children as efficiently as milk, and as acceptably. By the early 1960s, it seemed as though the final stages were in sight. The only missing link was a strategy for moving the foodstuffs off the laboratory bench into health centre rations for the under-fours and into the culinary repertoire of mothers keen to see their children grow and flourish when they left the breast. A great deal of interest had been aroused and many products were at a relatively advanced stage of development; others had already been launched on the market.

When the research and testing programme began in earnest in 1956, Unicef and FAO were already able to point to the two practical projects they were jointly supporting: 'saridele' in Indonesia and fish flour in Chile. At neither project did things go entirely according to plan. In Jogjakarta, technical hitches during the plant's construction meant that 'saridele' did not come on stream until 1957, and not until the following year did output reach the 300 tons target. Although the 'saridele' plant was still a mecca for protein enthusiasts from Unicef and elsewhere, its costs and the budgetary climate necessitated some serious rethinking. Originally the intention had been for the government to buy the whole output, and distribute it to hospitals, health centres, and in the school feeding programme. Instead, half the output was sold as a flavoured drink, imitating the milk conservation pattern Unicef promoted in the dairy industry: high-priced products subsidizing the welfare component. The fish flour plant did not go into full production until the early 1960s; here too the cost equations turned out to have been over-optimistic, and the market price of the foodstuff made it less appropriate as a welfare food or nutritional medicine than had been originally anticipated.

A product which did made a successful transition from the laboratory to the production phase was a weaning food developed by INCAP. In 1950, Scrimshaw and his colleagues had set about analyzing the nutritional value of every common locally-grown and edible plant. They started to blend various grains and legumes in 1951; it took them eight years to achieve a formula that was scientifically satisfactory, palatable, cheap and easy to prepare. The final recipe combined cornmeal, ground sorghum, cotton-seed flour, yeast, calcium and vitamin A in a powder whose taste was bland and inoffensive. INCAP mimicked a popular traditional drink called *atole*, a gruel made from ground corn, and marketed their version—'incaparina'—as a health-giving *atole* for children.

'Incaparina' was sufficiently successful to attract a sponsor from the food industry. In 1961, Quaker Oats of South America, based in Colombia, signed a licensing agreement with INCAP, and a few years later put the drink mix on the market for a price of ten cents for a week's supply. Unicef encouraged its use in schools and health centres and by 1966 total sales in Latin America had reached 4·5 million pounds. By the late 1960s, the product had established itself; it is still on sale in Central America today.

But by then it had become clear that however successful certain low-cost, high-tech, high-protein foodstuffs might be among families of a certain income level, the involvement of Unicef in their production could no longer be justified.

Processed substitutes for milk were not the salvation of the protein malnutrition problem because they could not become a common item of home consumption in the families whose children were most likely to be malnourished. Mesmerized by the promise of food technology, carried along by the enthusiasm of research institutes, paediatricians, government sponsors and popular applause, it took time for Unicef and its international and national partners to absorb this lesson. However biologically and technologically successful their efforts were, the advocates of processed weaning foods eventually ran up against the same old impenetrable barrier of the lack of an 'infrastructural' network among those they were trying to reach.

As with the promotion of safe and wholesome milk, Unicef had started by thinking in terms of supplementary feeding; but even if they were used exclusively as malnutrition 'medicines' or welfare foods in children's wards and school lunches, the budgets of most ministries of health in less well-off countries could not carry the expense on their own, as the experience with 'saridele' and fish flour showed. Even to use the products for organized welfare, they had to be put on sale to the public at large. Welfare on its own was, anyway, too limited an objective: mass programmes of supplementary feeding rarely reached the weanling child. If the new foods were to be widely eaten at home, the food industry had to be sufficiently interested to manufacture them and channel them down the distribution network for marketed goods. But as time went on, and few companies in the food industry expressed enthusiasm, Unicef began to discover an irreconcilable tension between its own welfare motivation and the products' economic viability.

Cheap ingredients and the miracle of food technology could only resolve the first generation of problems connected with putting synthetic foods into the mouths of children. In 1963, at a meeting in Rome with food company representatives, Unicef and FAO pointed out that the industry had so far made only a few timid attempts—mostly in Latin America—to fulfill their nutritional duty to the next generation by producing and marketing protein-rich weaning foods. The reply was not encouraging. The introduction of a new foodstuff onto the market in a developing country was such a precarious proposition, the industry's representatives pointed out, that even with assistance from government or international organizations, few companies could find the risk worth taking. All sorts of information must be collected—sociological, medical, dietary, economic—before such a proposition could even be contemplated. Even if thought to be sound, a loss could be anticipated over a relatively long period; and even if

a market for the new food was eventually established, the profit margin on a product intended for consumption by poor families would always remain very low. The commercial food producers could not invest in a foodstuff they did not believe would keep a factory running. Profit and nutritious food for the poor were very uneasy companions.

Even where the food industry did become involved, their best efforts could not shift the processed weaning food much beyond the standard network of retail outlets, all of which were in the towns, and most of which served the better-off. The 'infrastructure' needed to distribute consumer products from the modern world to the world inhabited by most of the malnourished children was little better developed than that of health, education or social services. There were few shops for such families because they had little purchasing power and were not customers for more than a handful of manufactured products – salt, soap, matches, kerosene, a utensil or two. In a word, such people were poor. Malnutrition was a 'disease' suffered by the children of the poor, and since the poor were poor they could not buy their protective way out of it, by two cents a day worth of *atole* or any other biologically impeccable alternative. If an egg, a cup of milk, a fish, or a slice of beef was for them a luxury ingredient, even more so was a powder in a packet.

To put a factory between the poor and their food supply was unhelpful, to say the least. Most of the people in the rural parts of Asia, Africa and Latin America grew their food, trading any surplus in the market. The limit of their food processing experience was to spread certain grains or berries in the sun to dry – and to winnow, to scrape, to grind, to pound, to mill, sometimes to ferment, the crops they harvested and stored in their granaries. In a family living on the edge of subsistence, money was a rare commodity. Even urban people in the lowest social strata spent as little as possible and that meant by definition mostly cheap natural produce from the market. Only the better-off could afford a can, a packet, a 'convenience' food. A woman in the town who bought her family's food supply in a store might put a processed weaning food on her metaphorical shopping list; some would be able to afford the new food where they could not afford an imported equivalent. But those did not include the really poor, the families whose children were most likely to be malnourished.

In 1967, twelve years after the testing and research programme began, Unicef began to adjust itself to the irrefutable evidence that processed foods with a high-protein content had a limited application to the public health problem of child malnutrition. Unicef did not actually withdraw its support from all efforts to develop high-protein foods; certain well-thought-out, economically-hopeful enterprises continued to gain support in India, Algeria, Peru, and other places. But stringent conditions were laid down about the pricing and distribution structure which would have to be guaranteed before support would be forthcoming. As in the case of malaria

eradication, Unicef made the conditions of its support so difficult to fulfill that without ever having to say so explicitly, it effectively pulled out of manufacturing local foods. It had finally recognized the naivety and ethnocentricity of trying to use the food-processing technology developed in industrialized countries to help the poor and hungry child living in a totally different consumer world.

By this time, the dimensions of the 'protein gap' had also been redefined. The focus which narrowed so tightly onto protein in the early 1950s had been broadened: protein deficiency and food deficiency were now regarded as close neighbours to one another, and the notion of 'medicinal' response to a 'disease' was seen to be far too limited.

Large-scale supplementary feeding through schools and institutions was by now also regarded as an anachronistic approach, except for victims of emergency or complete indigence. For these, as for children in hospital wards or nutrition rehabilitation units seriously ill from kwashiorkor or other diseases of nutritional deficiency, milk or a close substitute was still an optimal therapy.

During the late 1960s, when surplus skim milk was no longer available in large quantities for donation to welfare programmes, the US began to experiment with CSM, a protective food for small children composed of corn flour, soy flour and skim milk, with added vitamins and minerals. CSM, unlike most of the locally-processed mixes, had a future; but it was a future paralleled by the use of dried skim milk in the supplementary feeding schemes of earlier years, not a solution to the more intractable everyday problem of child malnutrition as a problem akin to respiratory or diarrhoeal infections. The new approach to child malnutrition as a public health problem was 'applied nutrition'; its emphasis was on growing nutritious foods and keeping chickens and other small livestock in the family or village backyard.

In the second half of the 1950s, as the food technologists ground and mashed and powdered their ingredients in the laboratory and proved that combinations of this with that produced biological formulae nearly akin to the nutritious elixir produced by the dairy cow, it occurred to some of them that the same chemical transformation would as well occur in a cooking pot as in a test tube. It did not need the intervention of a scientist, any more than a laboratory or a factory, to make a home mix of vegetable and animal protein which would do the same for the small child as any powdered version in a packet. With the right information, people who grew their own food could do the whole thing themselves.

What was true for milk substitutes also turned out to be true for milk. A dairy was also a factory; and a factory product was bound to remain out of reach of the poor, at least for the foreseeable future. The milk conservation

programme had been set up to speed up the moment at which underfed children could be supplied with free or subsidized milk. In Europe, making that moment arrive more quickly had required some deft topping up of equipment, or training, or giving a fillip to safe milk policies. As the years went by, it became clear that any remotely similar basis for a welfare programme based on milk conservation only existed in a handful of countries outside Europe: India, Pakistan, Chile and a few others. In most parts of the underdeveloped world, no amount of speeding up could make the moment arrive at which the really underfed child of preschool age would daily consume a nourishing drink of pasteurized milk from a city dairy, in the home or anywhere else.

When Unicef first offered assistance for milk conservation in the less well-off countries, no-one anticipated that upwards of 600 million pounds of skim milk powder would be made available to such countries free of charge every year. Since Unicef's share went to welfare programmes, there was no clash—theoretically at least—with efforts to boost local milk production; Unicef believed the contrary, that such programmes helped create a taste and demand for milk. But all the free milk floating round the world was bound to have an effect on many countries' incipient dairy industries. However exciting the prospect of processing the product of local cows in gleaming new equipment, in the cold light of day much of the effort turned out to be expensive and complicated. Meanwhile free, clean, already packaged, nearly unperishable milk powder was readily available. In many Central American countries the fledgling milk industry could not stand the competition. Unless governments took steps to control the marketing of low-priced skim milk from overseas—which sometimes they did and more often they did not—the market for domestic milk was virtually destroyed and milk production seriously discouraged.

In such circumstances, the basis on which Unicef had provided assistance to the dairy industry fell apart. Where there was no domestic surplus, there was no possibility of subsidizing the provision of low fat or skim milk for welfare distribution out of the profits on cream and butter. Many of the processing plants assisted by Unicef were still operating way below capacity seven or eight years after their original installation. Unicef's agreements with government authorities were optimistically based on the idea that within a few years the new plant would have 'catalyzed' dairy production, and the price of milk would have dropped to the point where it was much more widely affordable.

In practice, this rarely happened. Meanwhile the new dairy faced all the problems of establishing itself economically during a period when its output was supposed to subsidize welfare feeding. Not surprisingly, when the period of obligation came to an end, many governments were either unable or unwilling to absorb indefinitely the costs of the supplementary feeding programme.

While in certain countries the availability of free skim milk powder disrupted the prospects of the dairy industry and undermined Unicef's milk conservation assistance, in Asia it temporarily did the opposite: in India its availability for 'toning' high-fat buffalo milk was central to the economic viability of welfare schemes. While imported skim-milk powder was available in quantity, free or cheap milk distribution from many Indian city dairies was practicable. But if the supply dried up—as it did in 1965—the output of toned milk was drastically cut back. The customers for free or subsidized milk distribution were the first to suffer.

Unicef's milk conservation activity continued through most of the 1960s, and in some parts of the world—notably in Africa where the dairy industry was more embryonic than elsewhere and special consideration was given to helping it get started—it went on into the early 1970s. But from around the midpoint of the decade, milk conservation as a way of making an important contribution to child nutrition suffered an eclipse. Many countries had been inspired to formulate national dairy policies, dairy managers had been trained to put them into effect, and dairy industries launched. Unicef had contributed nearly $24 million altogether to this effort; but enthusiasm for milk as the universal food for children was beginning to appear misguided.

After all, it seemed, those who benefited most directly and in the largest numbers from the Unicef milk conservation schemes were the families who supplied milk to the dairies. The focus on production rather than consumption, the focus which years before Verghese Kurien had adopted at Anand, was the one that proved most successful in using the dairy industry to help the children of the Unicef target family. The success of the Amul enterprise afforded the most striking example of the improvements in diet and living standards which followed a rise in the incomes of the owners of milkable beasts.

Kurien's whole multimillion rupee industry was firmly based on the buffalo owner in the village. The system of organization was, if not unique, uniquely successful: its tiers of buffalo owners, societies, unions, and State-level federations assured a regular income to its members, and supplied cheap and high quality products to its consumers. Better family fortunes could be seen in better child health, better dress and housing, enthusiasm for education, and the acceptance of change. Co-operative profits were ploughed into running schools, dispensaries, health centres, youth clubs, and improving roads and other community services. In 1963, a special accolade was accorded Anand's success. An autonomous body, the National Dairy Development Board, was set up under the aegis of the federal government to promote milk producer co-operatives all over India. Prime Minister Shastri appointed Kurien Director. Anand had become a model not only for the milk industry, but for the national struggle against rural poverty.

In 1969, dairy development in India was propelled by Kurien into a phase called 'Operation Flood'. To finance the programme, the government used the same device which had been applied on a more modest scale in Bombay in the 1940s: India procured quantities of world surplus dairy products as gifts, sold them domestically, and invested the profits in its dairies.

Operation Flood was so-called after the 'flood' of milk it intended to produce from the rural areas by stimulating production in the country's milksheds. In its first phase, milk markets in the four metropolitan cities of Bombay, Calcutta, Delhi and Madras were linked to twenty-seven milksheds in their hinterland through a network of co-operatives. By 1981, 1·5 million families had joined rural groups and the national milk output had nearly doubled.

Many international organizations played a role in Operation Flood: the World Bank, FAO, the World Food Programme, the EEC. Unicef also offered support, partly for old times' sakes. By this time such a project was no longer a risky proposition in humble surroundings seeking donors prepared to make a leap of faith. On the contrary, it could command more financial and political support than it usefully knew what to do with. By 1970, Unicef was moving away from the dairy cow. As the answer to the problem of child nutrition, milk from an animal had finally been discarded.

Main sources

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