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International Nutrition Programs

Improved food practices are essential to reasonable progress for a large part of the world's population.

C. G. King

Contrasts in food practices in various parts of the world are unbelievably great. They are fascinating to study and full of surprises, and they are often a dramatic index of health. Many individuals in all countries appear at least to be in good health, and probably are, but millions of others may be barely surviving in areas where food deficiencies are a major cause of sickness and death. One needs to consider large numbers of individuals to get a valid picture of the situation. Certainly the diets that are presented to most tourists are not indicative of what local populations eat routinely in rural, village, or slum areas.

Partly by choice, but chiefly from necessity, man has learned to survive on rations that differ greatly from the tenderloin steaks, frozen green peas, french fried potatoes, and strawberries with ice cream that one may have at any time of the year in large cities. Varied, attractive, and healthy diets are easily within the day-to-day reach of entire populations in technologically advanced countries. But in stark contrast, year-round diets are limited almost entirely to fish and potatoes on the island of Tristan da Cunha; to fish and seal in large areas of the arctic; to tree grubs, lizards, weeds, and kangaroos for primitive Australians; to rice with a few chick peas and some fresh vegetables for millions in India; and to corn, manioc (tapioca), beans, and plantain or coconuts in large areas of Africa and Latin America.

In areas such as the United States, Canada, and Western Europe, we no longer have an appreciable incidence of classical deficiency diseases such as rickets or scurvy, and when such diseases do occur, they are generally the result of gross individual neglect or stark ignorance. Nevertheless, although the life expectancy in these Western nations is twice that in many parts of the world, all countries share important problems related to nutrition, such as coronary heart disease, cerebral strokes, high blood pressure, overweight, diabetes, tooth decay, anemia, mineral imbalance, and special situations imposed by genetic abnormalities such as phenylketonuria and galactosemia, in which there is a failure to tolerate normal quantities of protein fragments and of milk sugar, respectively.

In nearly all areas where population density is high in relation to economic resources, there is a chronic or acute shortage of good-quality protein foods —a result of their relatively high cost and greater complexity and of the large amount of protein required in contrast to the small quantities of minerals and vitamins needed. Fortunately the high-quality protein foods such as meat, milk, poultry, fish, eggs, and, to a lesser extent, legumes such as beans and peas, are also good sources of minerals and vitamins. The animal protein foods have another great advantage in their flavor appeal.

Adequate medical and public recognition of the lack of sufficient good-quality protein as a major factor in high death rates, stunted growth, subnormal resistance to infections, and low nervous and physical vitality, has been slow to develop. The resultant penalty on health and economic progress has been and continues to be astounding.

A quick review of some facts will illustrate the tragedy that persists, as reported at the 1963 Conference on the Pre-School Child (*1*):

> The pre-school child, under five years, presents the major public health problem in developing countries today. Sickness rates are very high because these children are exposed to the usual diseases of childhood and also the parasitic infestations and infections of their environment. The mortality rates in the 1-to-4 years age group are sometimes forty times higher than the comparable rates among children of the same age in affluent countries. . . . It is estimated that 70 per cent of pre-school children in the developing regions of the world today are malnourished, particularly with respect to protein and calories.

Foundation for Progress

A healthy, vigorous populace is so basic to economic and social progress that this consideration of irreversible damage to pre-school children merits primary emphasis in every country (*2*). For those most handicapped educationally and technologically, the issue is particularly critical. Hence one of the most urgent services that technologically advanced countries can pro-

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vide to those that are less advanced is assistance in improving food resources and practices. Until this need is met, there is little prospect of political or economic stability—a goal of mutual advantage to advanced and retarded areas alike (*3–5*). In all such efforts, long-range educational assistance is fundamental (*4, 6*).

It is well to remember that, per pound of body weight, an infant six months of age needs about twice as many calories per day and about five times as much high-quality protein as adults need. Yet the prevailing practice in many countries is to feed infants and pre-school children bland, starchy food which is poor in protein content and quality. Even at four years of age, a child still requires about 50 percent more calories and twice as much protein per unit body weight as an adult.

As B. R. Sen, director general of the United Nations Food and Agriculture Organization, states (*1*):

> More than half of the world's population is undernourished or malnourished. Hunger and poverty form a vicious circle of economic stagnation . . . substandard health, and static institutions. To meet the basic needs of the 6,000,000,000 people who will inherit this planet by the end of this century (population doubled), the world productivity of food and other basic needs will have to be trebled or quadrupled.

Short-term food shipments and giveaway programs can be very helpful in periods of emergency, such as droughts, floods, and wars, and carefully planned, sustained, and supervised shipments can be very useful in public improvement programs such as the one now sponsored jointly by the Agency for International Development and the U.S. Department of Agriculture, or as demonstration material to promote public education in the UNICEF program. But such programs are of very limited value in the effort to solve basic nutrition problems in handicapped countries; these problems can only be solved by programs which are sharply and emphatically focused on production, distribution, and consumption of needed foods within each major area. Too often the temptation of producing cash crops, such as tobacco, cotton, sugar, and coffee, for export leads land owners and government agencies to encourage these crops at the sacrifice of requirements for health within their own countries. In some instances the export of minerals, special crops, or other resources can furnish a balance of payments for return shipments of needed food, but this approach is seldom successful for large areas. There is a very high risk that methods of distribution of the imported food will not be efficient enough to insure that the food will reach persons in low income brackets or those at a distance from shipping points, despite a national monetary exchange that appears to be favorable.

Many international exchanges of agricultural commodities are mutually advantageous, such as sending wheat and milk into the tropics, and citrus fruit, bananas, and pineapples into northern areas. A guideline in this respect is furnished in a statement from the Food and Nutrition Board of the National Academy of Sciences–National Research Council (*4*):

> It is shortsighted and tragic to go so far as to encourage increased use of land for production of cash crops for export from newly developing countries when the result of such a program is a failure to adequately feed and protect the health of the population as a whole.

Programs in Action

To develop food resources within a given country, long-range, sustained programs are necessary and should include:

1) Surveys to determine how much and what kinds of food will be needed to supplement currently available commodities, estimates of the cost of such foods, and estimates of the time which will be required to furnish specific commodities essential for health. Allowance for population growth is necessary. Cooperation among highly qualified agriculturalists, medical nutritionists, economic advisors, and educational leaders is essential for efficient planning.

2) Agricultural research and extension programs to furnish essential information at local and national levels and to promote and support production programs such as selection and genetic improvement of crops, the use of fertilizers, pesticides, and machinery, and transportation and storage of food products.

3) Education of distributors and consumers through ministries of health, agriculture, education, and commerce, to insure adequate distribution and consumption of essential foods as they become available.

4) Provision of training centers for a continuing supply of scientists, educators, engineers, economists, and others essential to a successful program; such centers should provide graduate training which would furnish competent personnel in agriculture, the health professions, human and animal nutrition, economics, food technology, home science, and the basic sciences of chemistry, physics, biology, and mathematics (*4–6*).

The most critical need is for adequately trained leaders to initiate and guide long-term programs to meet national requirements. Investments for this purpose by private foundations, international agencies, and national governments pay the greatest dividends and lay the surest foundations for continued success (*6*).

Meeting total human nutritional needs in order to lay a foundation for fundamental gains is the goal of several programs. One of the most dramatic successes in improving food practices on a large scale has been the program of crop improvement which the Rockefeller Foundation carries out in cooperation with the Mexican government (*3*):

> Twenty years ago, Mexico's 21 million people averaged 1700 calories a day. Today Mexico's 37 million people average 2700 calories a day, and they have a more varied diet that increasingly includes animal proteins.

Wheat, corn, and bean crops were approximately doubled; broiler production was tripled; egg production was up 2½ times.

> As one project was on its way to success, we added others. . . . The last step was to extend our work into the animal sciences, with research on poultry, dairy and beef cattle, swine and sheep.

Utilizing their experience in Mexico, India, Japan, and other areas, the Rockefeller Foundation and the Ford Foundation have joined forces recently in a large and very significant program at the International Rice Research Institute in Los Baños, near Manila, Philippines (*8*). Coordinated worldwide programs for rice production and, on a lesser scale, for the production of sorghum, millet, wheat, and corn are underway, to increase both the yields and nutritive values of these major crops.

The U.S. Foreign Agricultural Service is planning for a similar program on legumes, to be centered in India and supported by funds made available

by the provisions of Public Law 480 and by the Indian government. This project, too, has immense possibilities because of the high nutritive value of many legumes such as soybeans, Bengal gram (chick peas), cotton seed, and sesame, which are especially important because of their content of essential amino acids which can supplement the very limited quantities supplied by the food grains. These legumes are less costly than animal protein foods and contain more vitamins, minerals, and protein than the cereals (see 9).

Some 10,000 genetic lines of rice, 6700 types of sorghum, and 5000 types of millet are under systematic study for yields and dozens of other characteristics that are important for farmers, processors, and consumers in each major area. In addition, nutritive values of these grains, particularly their protein quality and vitamin content, are being studied. In some instances the lipid, starch, and mineral content is important also.

Genetic research offers great promise in combining the characteristics most desired in each area and for each major use. For example, even a moderate improvement in the content of essential amino acids or vitamin A or vitamin B_1 would add tremendously to the value of such crops in nearly all sections of Southeast Asia, Africa, the Middle East, and Latin America, and could improve the quality of food supplies in Europe and North America as well.

The Ford Foundation furnished about $8 million for land and buildings to establish the Rice Research Institute in Los Baños, and the Rockefeller Foundation has built up their annual support in the form of personnel, equipment, and programming to nearly $1 million. The prospect of accomplishing major improvements in the economy and health of half the world's population is already very encouraging. Apparently it will be possible to increase the average yield of rice per acre in Southeast Asia by 100 percent or more, and simultaneously to increase the protein content of the rice. Substantial gains are in prospect also for sorghums, millets, wheat, corn, legumes, and potatoes. A new genetic lead to produce high-lysine corn, for example, offers promise of greatly improving the protein quality of this crop.

Meanwhile, many of the larger cities and adjacent areas where malnutrition has been rampant for centuries are making remarkable progress in producing and consuming high-quality pasteurized milk and other dairy products and in putting them within the economic reach of a large fraction of the population. A modern dairy development in Bombay, for example, furnishes an excellent "toned" milk supply for the entire city by blending local buffalo milk (8 percent fat) with water and imported dry skim milk.

Substantial increases in grain, legume, and forage crops furnish a basis for increased production of milk and other animal protein foods. Particularly in Latin America, commercial dairy companies are thus expanding steadily and contributing both to health improvement and to economic progress based on modern technology.

United Nations Aid

The United Nations Children's Fund (UNICEF) has maintained a vigorous program of financial assistance to maternal and child health programs in underdeveloped areas. Distribution of milk to pre-school and school children and to mothers during lactation has been accompanied increasingly by educational measures. This program and several others based initially on food distribution, school luncheons, and school gardens are thus insuring that permanent gains will result.

In addition, UNICEF, in cooperation with FAO and the World Health Organization has supported increased milk production programs in many areas. It has supported an international center for pediatric training in Paris for many years. Considerable support has been given also to the development of protein-rich foods from plant sources such as soybean, cottonseed, and sesame. Of the total 1963 expenditure of UNICEF (about $33,035,400), $6,768,500 was devoted to nutrition programs, distributed as follows: $552,200 directly for feeding of children, $3,385,000 for milk conservation (dairy equipment and so forth), $2,661,400 for school and related programs, and $167,600 for technology on high-protein foods.

The activities of the United Nations Food and Agriculture Organization have been increasingly significant in stimulating worldwide interest in the food and agricultural problems of the underdeveloped countries. It has held conferences, conducted surveys, issued publications, and distributed educational materials; these activities have been supplemented by the expenditure of modest sums for fellowships and by temporary assignments of staff members and experts in agriculture, nutrition, food technology, and home economics. Efforts such as a proposed "world food bank" have had varying degrees of success. Currently FAO's Freedom From Hunger campaign has enlisted substantial support in the form of food supplies, fertilizers, farm machinery, loans of personnel, modest financial grants, and cooperation by private and national organizations. FAO's annual total budget for 1964–1965 is about $38,838,300.

In food and nutritional activities that directly affect public health, the World Health Organization frequently collaborates with both FAO and UNICEF. The Protein Advisory Group, supported jointly by all three agencies, has been particularly active in promoting and assisting measures to improve the use of high-quality protein foods for infants and pre-school children. In addition, these three agencies sponsor many national and international programs in maternal and child health, in which nutrition education and feeding programs receive needed emphasis. Special assistance has been extended in support of nutrition research and to area programs such as the work of the renowned Institute of Nutrition of Central America and Panama. Of WHO's total 1965 budget ($38,230,000), about $717,200 is allocated in the field of nutrition.

National Agencies

In India, where the problem of population and nutrition is most acute, the government spent over $2 billion on agriculture, irrigation, and community development during its second Five-Year Plan, and this type of expenditure was increased during the third Five-Year Plan (1961–1966) to $3.5 billion. The Minister of Food hopes that by 1971 India's food production will be adequate for her population. To date, however, food production has remained grossly inadequate, and the situation currently is especially serious because of a drought and because the annual increase in population has reached 11 million. India relies

chiefly on milk as a source of animal protein, although the annual consumption of milk per capita is only about 50 kilograms, compared with about 300 kilograms in the United States and in many other countries where generous quantities of meat, poultry, eggs, and fish are also consumed. Fortunately food shipments from other countries have lessened India's current plight. In November 1964 shipments of wheat from the United States alone amounted to 600,000 tons per month, up from the earlier total of 200,000 tons per month.

Situations such as India's give emphasis to the need for maximum use of plant sources of good-quality protein and for an increased total production of food. Progress has been substantially accelerated by a grant of $550,000 made in 1956 by the Rockefeller Foundation to the Food and Nutrition Board of the National Academy of Sciences–National Research Council for research to evaluate potential sources of high quality protein foods in cooperation with the three UN agencies.

The Institute of Nutrition of Central America and Panama has been successful in developing a blend of cottonseed flour with corn meal, yeast, lime, and vitamin A, and similar mixed products from plant sources that support good growth and health in children, at low cost and with indigenous crops. Per unit price, ten times more protein can be purchased in this product, which is marketed as Incaparina, than in skim milk powder. Soy flour, sesame, and grain sorghum can be used in similar products. Small-scale developments of this nature already offer great promise in South America, India, Africa, and Southeast Asia.

One of the most productive international programs sponsored by our national agencies has been the support of universities and experiment stations in other countries by making use of the facilities and personnel of selected universities in the United States. Staff members on leave have accepted advisory posts for sustained research and teaching in the agricultural and medical schools of the underdeveloped countries, and staff members from abroad have had reciprocal on-leave appointments in training centers here. Activities of this nature should be greatly strengthened by more definite support for career opportunities in international work. Short-term appointments tend to handicap the attainment of long-term objectives, and extended absence from the home base handicaps a staff member with respect to research publications, professional contacts, graduate teaching, and opportunities for promotion. Another serious deficiency in existing programs is the meager support of fellowships for scientists in newly developing areas who desire and critically need the kind of advanced training in nutrition and food sciences that is available in the United States.

The U.S. Interdepartmental Committee on Nutrition for National Development has conducted some 22 nutrition surveys in underdeveloped countries. These surveys have been very fruitful in demonstrating the nature and degree of nutritional deficiencies in specific countries and in stimulating local interest in corrective measures. Unfortunately, no provision was made initially for continuity of contacts made during the surveys or for follow-up programs, and hence much of the potential value of such studies was lost. However, new arrangements adopted in 1964 for administration and support, particularly within the Agency for International Development, offer encouragement for the continuation of this important activity.

The magnitude of the Food For Peace program, which originates in part from true humanitarian motives but largely as a means of moving the enormous quantities of agricultural commodities accumulated under the government price-support system, can be envisioned from the statement made by the Agency for International Development in 1963 that the Food For Peace program alone had cost more than $8 billion since its adoption in 1954; that the annual cost to simply store surpluses in 1962 had been about $400 million; and that wheat shipments in eight years of the program had amounted to about 2.5 billion bushels. Total shipments under the program in the fiscal year 1962 reached a record of $1.6 billion, while shipments made through normal trade channels reached a total of $3.5 billion (*10*).

Many commercial food companies are active in the development of food production, processing, and distribution programs within the underdeveloped countries. With their experience in management, their knowledge of production and processing technology and national and international marketing practices, and their assistance with investment funds, these companies can markedly accelerate progress in the entire sequence of steps from scientific agriculture to the adoption of efficient and healthful practices in food processing and food consumption. Although the limited purchasing power of the consumers imposes a severe limitation on processing and merchandising practices, progress is under way, particularly in the fields of dairying, milling, fishery, poultry and egg production, and, gradually, canning and freezing of foods.

Steps toward the Goal

The Food and Nutrition Board of the National Academy of Sciences–National Research Council has suggested the following guidelines for the development of adequate programs in nutrition and food technology within each country (*4*):

1) Establish departments of nutrition in universities with specialists in clinical nutrition, biochemistry, physiology, dietetics, and food management.

2) Organize and support curricula for training of medical students, nurses, dietitians, home demonstration agents, and public health educators in nutritional science.

3) Assist and support the conduct of dietary surveys, nutrition clinics, and research programs on problems of greatest local and national importance.

4) Establish food technology laboratories in one or more agricultural colleges, with specialists in bacteriology, food analysis, food engineering, and food management.

5) Organize and support training programs in food sanitation, quality control, research, and demonstrations, emphasizing the production and processing of high-quality protein foods.

6) Organize councils on food and nutrition to coordinate programs and advise the secretaries or ministers of agriculture, health, education, commerce, and economic development.

International agencies, government agencies, universities, private foundations, and private industry can give substantial assistance in working toward such goals within each country. The spirit of independence and a determination to build a strong society will grow in proportion to the emphasis placed on long-range goals in education and research.

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News and Comment

1965: Herewith, a Conversation with the Mythical Grant Swinger, Head of Breakthrough Institute

News and Comment is pleased to open the New Year with an interview with Grant Swinger, director of the Breakthrough Institute.

Q. Dr. Swinger, what is the Breakthrough Institute?

A. It is a research establishment dedicated exclusively to fulfilling the public demand for scientific breakthroughs. We are the shock troops of science.

Q. What breakthroughs have you achieved?

A. It is difficult to say at this point, but we have been able to report to the public and the granting agencies a broad variety of *imminent* breakthroughs. Our U.S.B. program is a good example.

Q. U.S.B.?

A. Utilizable Sonic Boom. The boom problem is delaying the development of a supersonic transport. Other researchers are seeking to eliminate or minimize sonic boom. We have decided that this is impossible. Therefore, we are seeking ways to extract some utility from the booms that these planes would create over our cities.

Q. What utility could there be in sonic boom?

A. We don't know. But perhaps the boom could be employed as a metropolitan area alarm clock system or for detecting weak structures. In any case, we have fully panelized the problem.

Q. Panelized?

A. Yes, we have placed the problem before a panel which has full responsibility for planning a breakthrough.

Q. How was the panel selected?

A. By our Standing Ad Hoc Committee on Panels. It makes all our panel selections, including the recently announced panel on Politico-Scientific Trends in High Energy Physics.

Q. What will be the function of that panel?

A. Quite simply, to plan the next generation of nuclear accelerators.

Q. Hasn't that job been performed recently by another study group?

A. Yes, but that study has been rebuffed in Congress and elsewhere, as might have been foreseen.

Q. How will your study differ?

A. The breakthrough in this regard is only foreseeable; it is not yet imminent. But, in general, we expect to take technical cognizance of the political realities of the problem.

Q. More specifically?

A. We are studying what we refer to as the T.C.L.A., Transcontinental Linear Accelerator. It would commence in Berkeley and terminate in Cambridge and thereby pass through at least 12 states, which means that 24 senators and about 100 congressmen could reasonably be expected to support it.

Q. Would it run in a straight line?

A. From a technical viewpoint this would be preferable, but we are considering the possibility of skirting several congressional districts which went against the administration in the last election. As we see it, there might be a few loops, particularly to take in areas where defense installations are scheduled to be closed.

Q. Is this practical?

A. Technically, perhaps not, but otherwise I would say it is immensely practical. But in case the T.C.L.A. proves too difficult, we are examining the possibility of a vertical linear accelerator at the only point in the country where four states intersect—Colorado, Arizona, Utah, and New Mexico. That could pick up eight senators and 11 congressmen at relatively modest cost. We've run that through the machine and come out with a very attractive bev/dollar/vote analysis.

Q. What are some of the other activities at the Breakthrough Institute?

A. We are deeply involved in a series of nutritional studies and, in fact, have been able to announce several imminent breakthroughs in this area. We are working on a process that would convert any waste product into edible foodstuffs, with virtually all of the original flavor removed. We have encountered some problems in consumer acceptance, but here again we are programming for an imminent breakthrough. We are convinced that people can relearn food preferences.

Q. What else are you doing?

A. We are developing a number of educational devices to expand scientific awareness. For example, we are working on a parlor game called Organ Transplant. We are also preparing a manual for the scientific community called, "As Long as You're Up, Get Me a Grant—A Guide to NIH Administrative Practice." And to assist high school students with the new physics curriculum, we are preparing a recording called, "Music to Study Quantum Mechanics By." It's sung by a