Reprinted from AMERICAN JOURNAL OF PUBLIC HEALTH, Vol. 49, No. 10, October, 1959

The need to provide enough food for all the people of the world is a basic public health problem today. The current situation is well described in the following symposium—both what is being done and what remains to do.

MEETING THE CHALLENGE OF FEEDING THE WORLD

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THERE ARE no reliable statistics on the actual number of people suffering from malnutrition, but known facts suggest that more than half of the world's population subsists on diets inadequate for health. This is not a new phenomenon. There has probably never been enough food in the world to feed everyone well at any time in the world's history. Thus, if the challenge of feeding the world is to be met, food supplies must not only keep pace with population growth, but must be increased sufficiently to insure that the nutritional levels of millions of needy people are improved.

Present World Situation

At the present time the statistics on food production and population for the world as a whole are not entirely discouraging. Figures indicate that in recent years the world's population has been increasing at a rate of about 1½ per cent annually, while food production, after recovering from wartime dislocations, has risen at an average annual rate of about 2 per cent in the past five years.

But the essence of the world food problem is not what is happening in the world as a whole or on the average, it is the fact that there are great differences between one region and another. Although world agricultural production has increased steadily in recent years, it has increased unevenly. The greatest increase has occurred in the technically advanced countries.

At the same time, advances in applied medicine, in public hygiene, and in health education have led to a decrease in the death rate in many countries, but more particularly in the less developed and less well-fed countries. As a result, net population increases have been greater in the less technically developed countries than in the so-called advanced countries. The gap between the well-fed and the ill-fed has widened, not lessened.

At one end of the scale people in the United States and a few other countries of the temperate zone are not only living well, with a food supply providing more than 3,000 calories per person per day, but these countries are producing more food than can be sold in home and foreign markets. At the other extreme, in countries like India the farm land is overcrowded, technics have scarcely changed in 2,500 years and the production of food and of goods that can be traded for food is scarcely sufficient to provide the population with an average intake of 2,000 calories per day, with many people, of course, getting less.

Low production and productivity in the less developed countries are key elements in the world food problem. Average income per capita in most of these

countries ranges from about $50 to about $150 per year. The majority of the people live largely on diets of cereals and root crops, as they cannot afford to purchase other foods.

The solution of the problem looks simple: Distribute the agricultural surpluses from the United States and the other exporting countries among the countries where there is greatest need, and at the same time assist the less developed countries to improve their agricultural practices. However, let us look again at the situation, taking the United States and India as examples.

United States

The people of the United States began with a great unsettled area containing some of the best agricultural land on earth, and vast sources of raw materials. These facts and the circumstances of the industrial revolution made it possible for them to develop a remarkably efficient industrial and scientific system, so that the capacity of the United States to produce food has kept well ahead of the population and it now has a superabundant production.

India

A very different situation prevails in India. The population of India in the first six decades of the present century has not increased at a particularly rapid rate, percentage-wise. The rate has averaged 1.2 per cent per year, although a higher rate has prevailed in recent years. But India's farm land was already heavily settled in 1900. The percentage of the population engaged in agriculture has remained relatively constant at around 70 per cent, but the actual number of people living on farms has increased. This has resulted in continued fragmentation of holdings and increasing numbers of landless agricultural workers. Soils are exhausted. With the pressure of the population on the land, farmers cannot afford to leave wooded areas standing; without wood, they burn dung for fuel; without dung, the fields go largely unfertilized. Yields are among the lowest in the world. Illiteracy and religious beliefs hamper the spread of even such improved farm practices and food habits as may be practicable under these conditions.

On the population side, farmers want large numbers of children because they are thereby assured of the necessary labor to meet peak season loads. Also, children are counted on for support in old age. The birth rate is high, but the death rate is declining. With the continued extension of sanitation and health services, the death rate is likely to decline more rapidly in the future, resulting in a rapid increase in the population. The annual net increase in India's population is about 2 per cent at present.

There are two problems to be solved: The first, to increase per capita food production; the second, to teach the people to make the best use of their food supplies. The Indian government is keenly aware of these problems and is doing a great deal to improve agricultural practices. It is building large and small public irrigation works, encouraging farmers to install tube wells and Diesel pumps to irrigate their fields, sponsoring agricultural research, helping finance pest and disease control services, and developing a national agricultural extension service. It is also paying attention to better transportation facilities, better marketing institutions for farm products. and farm credit programs.

However, there is so much to be done and the resources the government can command are so limited by the poverty of the country that progress is necessarily slow. Demand for food in India still outstrips production, so that heavy imports of wheat and other grains are necessary to even maintain supplies at their current levels. Larger amounts of foods cannot be imported commercially from countries like the United States

where there is an abundance, because the government does not have the dollars. Special food distribution programs are emergency measures, and are not the long-term solution. The problem of maldistribution of food in the world will not be solved permanently until the poverty of countries such as India is cured.

One of the hopeful things for the future of the thickly settled Asian lands is the experience in Japan. Sixty years ago, Japan was largely an "underdeveloped" country. Today, through the rise of industry and the application of scientific research and methods to agriculture, yields per acre of most Japanese crops are among the highest in the world and Japanese farmers, though still handicapped by the small size of their holdings, are the most prosperous in Asia. Japan has also developed a widespread program of education in nutrition, and has introduced supplementary feeding programs for school children, industrial workers, and other groups.

International Assistance

An increasing development in world affairs since World War II has been the growth of international assistance programs. While there was some international aid, sponsored largely by church groups and private foundations, before the war, there are now permanent programs and institutions for the purpose, sponsored by government as well as non-government organizations. In the long run, the major part of the effort required to ease the problem of how to feed more people better must be performed by each of the countries concerned, but the international agencies such as the Food and Agriculture Organization (FAO), the World Health Organization (WHO), and the United Nation's Childrens Fund (UNICEF), and bilateral agencies such as the United States International Cooperation Administration (ICA) provide channels through which countries can share their technical knowledge and help each other to solve their problems more rapidly than would be the case otherwise.

FAO was the first of the United Nations agencies to be established after the war. It came into being in 1945. WHO was established in 1948. The programs of FAO and WHO follow the same general pattern: each is concerned first with helping member governments determine what their problems are (FAO in the field of food and agriculture, WHO in the field of health), and then with promoting an exchange of information as to the best measures for dealing with them. This end is achieved by providing consultant help to member governments, by calling together expert committees and study groups, by awarding fellowships for study abroad, by training courses and seminars, and by publishing monographs, bulletins, and special reports.

Many of the activities of the two organizations which relate to nutrition are carried on jointly. Recently UNICEF has also given much needed material support. UNICEF assistance in combating world-wide undernutrition dates back to the post-World War II period in 1947 when the United Nations International Children's Emergency Fund was organized to meet the critical needs of thousands of sick and hungry children in the war-torn countries. Starting with an initial budget of about $1,000,000 and an emergency program of assistance to child care and feeding in Europe, it has gradually assumed a permanent and comprehensive function in response to the needs which have developed. At the present time, it allocates each year about $24,000,000 annually to assist more than 325 programs in about 100 countries and territories. These include material assistance to country programs for maternal and child health services; to disease control programs; to child feeding

through maternal and child welfare centers and schools; to milk plants and milk conservation and to the development of other protein-rich foods; and more recently, assistance to comprehensive country programs in the field of practical nutrition activities. In recent years about one-quarter of the UNICEF budget is allocated to the general field of food and nutrition activities.

Collection of Background Data

Lack of accurate up-to-date statistical information on agricultural production and on food consumption is in many countries a major obstacle to the development of a national policy on nutrition. Since sound measures for the improvement of nutrition can only be developed on the basis of information on the economic and social environment of the family, on the possibilities of improving food production and dietary practices, and on the nutritional needs of vulnerable groups within the population FAO and WHO have always promoted and given technical assistance to the collection of this information, and UNICEF has recently given material support to nutrition surveys.

One of the first tasks undertaken by FAO was a survey of world food supplies. This study was published as "The World Food Survey" in 1946. Since then FAO has continued to assist member governments to compile national food balance sheets annually. These are based on statistics for agricultural production and imports and exports of foodstuffs. FAO has assisted a number of countries to carry out food consumption surveys by providing training in survey methodology for local personnel.

Expert Committees and Study Groups

In October, 1949, only one year after the establishment of the World Health Organization, the first Joint FAO/WHO Expert Committee on Nutrition was convened to advise the two organizations on the development of their nutrition programs and to insure close coordination of their activities in this field. These meetings have continued at intervals of approximately two years and their reports[1-5] have become authoritative summaries of world nutrition problems, as well as guides to practical efforts directed at their solution. The reports have consistently called attention to such problems as protein malnutrition, pellagra, beri-beri, goiter, marasmus, vitamin A and riboflavin deficiency and nutritional anemias, as well as to the role in the solution of these problems of nutrition education, maternal and child health programs, agricultural extension and home economics activities, clinical and dietary surveys, nutritional anthropometry and other field activities.

FAO expert committees have made recommendations on calorie requirements[6] and protein requirements,[7] while WHO has convened a special study group to consider the problems of endemic goiter, ischemic heart disease,[8] and nutritional anemias.

The two organizations have also cooperated in a number of special studies such as the kwashiorkor surveys of Brock and Autret in Africa,[9] Autret and Behar in Central America,[10] and Waterlow and Vergara[11] in Brazil.

FAO/WHO/UNICEF Protein-Rich Foods Program

Recognition that a shortage of protein, particularly in the diet of preschool-age children in many areas of the world, was responsible for the disease kwashiorkor led to its consideration by the international agencies. The joint FAO/WHO Expert Committee on Nutrition discussed the problem at its meetings in 1949 and 1953. The surveys on protein malnutrition in Africa, Central America, and Brazil have been mentioned above. FAO

and WHO also sponsored two international conferences on protein malnutrition at Jamaica in 1953[12] and Princeton, N. J., in 1955,[13] with the cooperation of the Josiah Macy Jr. Foundation, New York. These conferences considered the extent of the problem and effective measures for its alleviation.

Action was stimulated by a generous grant from the Rockefeller Foundation in 1956. This fund is administered by the National Research Council Committee on Protein Malnutrition in collaboration with FAO, WHO, and UNICEF and is used to support an international program of research on protein foods. The UNICEF Executive Board approved an additional special allocation to enable the production and testing of initial lots of the food products to be studied in the research program referred to above. Valuable guidance to the research program since its inception has been contributed by the Protein Advisory Group established by WHO with representation from FAO and UNICEF.

Seven criteria were established to guide the selection of such foods: they must be available or capable of being produced locally; they must be within the economic means of the population to produce or buy; they must be readily transportable and have long storage life without refrigeration or other costly protection from tropical climates; they must be free of any toxic or deleterious effects; they must be acceptable to the population in taste, odor, and physical properties; they must have substantial nutritive values as protein supplements; and they must be products not already being used maximally as human food.

Up to the present time six products that appear promising have been produced and subjected to study. They are: fish flour, soy products, peanut flour, cottonseed flour, sesame flour, and coconut products. Others, such as sunflower seed and various legumes, may be added to this list later.

The initial objective in each case has been to locate a source for each type of product, to produce a test batch under carefully defined conditions and to study the product for its composition, biological value, safety in animals, and finally its biological value in man. The second objective has been to assist countries to establish or modify existing facilities, so that the food may be produced locally for human consumption and in a form suitable for feeding young children.

During the past two years, three of these—soya milk, fish flour, and peanut flour — have undergone sufficient research study and production-development testing to be nearly ready for extensive practical application. Participating in this coordinated work, either through the research or production funds mentioned above or through independent support, have been some 30 research groups located in 16 different countries and territories.

UNICEF's Increased Aid to Nutrition Program

The extension of UNICEF's emergency feeding program to a long-range program of assistance to supplementary feeding in health centers and schools has been made possible by large quantities of skim milk powder generously made available by the United States, and more recently by Canada and other countries. However, supplementary feeding, although valuable, is in itself insufficient to have a long-term effect, unless it has associated with it a comprehensive program of education in nutrition. UNICEF has, therefore, since 1957 developed in cooperation with FAO and WHO a program which includes: material assistance to nutrition education programs carried on by health services, schools and extension workers in agriculture, home economics and community development; assistance to practical measures such as school or community gardens, egg pro-

duction, poultry and small animal raising, fish ponds; and material assistance in the training of personnel required to carry out these functions.

Training in Nutrition

WHO has cooperated with FAO in sponsoring a series of regional conferences on nutrition in Latin America, Africa south of the Sahara, the Near East and South and East Asia. Other joint projects include a seminar on education in health and nutrition in Baguio for South and East Asia, a nutrition training course in Marseilles for French-speaking territories in Africa south of the Sahara, and one in Kampala for English-speaking territories in the same region.

FAO and UNICEF have jointly sponsored two seminars on school feeding in 1958, one in Bogota for personnel from Latin American countries, and one in Tokyo for South and East Asia.

Fellowships are one of the most important means at the disposal of FAO and WHO to give help of permanent value to countries in the development of their nutrition and general health programs. Such fellowships have been given to persons from a number of countries, including Algeria, the Belgian Congo, Brazil, Chile, Colombia, Costa Rica, Ecuador, Egypt, Finland, France, Honduras, Iraq, Lebanon, Paraguay, the Philippines, Thailand, and Viet Nam.

Role of Short- and Long-Term Consultants

WHO, to an even greater extent than FAO, carries out its programs mainly through the use of short- or long-term consultants assigned to assist countries or regions with both research and action programs in the field of nutrition. Short-term consultant visits are exemplified by the recent survey of vitamin A deficiency in Indonesia by a WHO team of three persons, and by short-term studies of pellagra in Yugoslavia, Egypt, and Basutoland. WHO consultants have initiated goiter surveys in Burma and Thailand. They have also assisted in the development of salt-iodization for the control of endemic goiter in Yugoslavia and visited 18 countries in Latin America for the same purpose.

A joint FAO/WHO team recently made a report on nutrition in Ceylon, while in Nigeria a joint FAO/WHO mission studied the need and possibilities for developing protein-rich foods.

The WHO Program in Central America and Panama

The program in Central America and Panama deserves special mention because the Pan American Health Organization administers an international institute for the countries of Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua, and Panama. The regional activities of PAHO and WHO in the field of nutrition have their headquarters in this institution. While the Institute of Nutrition of Central America and Panama (INCAP) was established to study the nutrition problems of its member countries and determine ways in which they may be ameliorated or solved and assist governmental and nongovernmental agencies within the countries in the application of recommended measures, it is also serving as a demonstration and training center not only for persons from Latin America but also from other regions with similar problems. It publishes a variety of information, education, and training material which, while designed primarily for use in its member countries, is available throughout the region.

Increasing Food Production

The use of better types of seeds and livestock is one of the quickest ways to increase agricultural production. FAO

has paid great attention to this type of assistance to member countries. For example, the introduction of hybrid maize from the United States into Europe, which was begun by UNRRA in 1947, and later taken over by FAO, has been of very great importance to Western Europe. The introduction of new types of rice in the countries of the Far East is another large-scale campaign in crop improvement.

Even more spectacular are the results that have been achieved by applying modern knowledge and technics to livestock production. FAO's work in this field covers animal breeding, animal nutrition, livestock and range management, and the control of animal diseases and parasites. Much is also being done to improve fish production by mechanization of fishing craft, and by the introduction of new types of nets.

Food Technology

In many countries there is growing interest in the application of modern developments in food technology. This will enable better use to be made of food supplies and will reduce food wastage. At the present time, FAO has food technologists who are working in Burma, Pakistan, India, Turkey, Indonesia, and Thailand.

FAO and WHO are working jointly in the field of food additives. A series of meetings of FAO/WHO Committees on Food Additives were held in 1955, 1956, 1957, and 1958.[14-17]

Resources of FAO and WHO

The total resources of FAO and WHO are very limited, considering the magnitude of their tasks. Only a small portion of their funds are spent on nutrition projects, the largest part of the FAO budget being spent on agriculture, and that of WHO on the development of health services. FAO's regular budget for the two-year period, 1958-1959, is $17 million. In addition, it received in 1958, $8,085,000 from the United Nations Expanded Technical Assistance Program (ETAP). WHO's regular budget in 1958 was $14,158,000, and in 1959, $15,083,000. It received $5,046,643 from ETAP in 1958. In 1958 FAO spent $986,780 from its regular budget and $396,430 from ETAP funds on nutrition projects. WHO's expenditure was $41,370 and $106,116 for the same period.

United States Assistance to Foreign Countries

The United States has contributed more than any other country to relief, rehabilitation, reconstruction, and economic development in foreign lands. United States government grants and credits for these purposes since World War II total about $42 billion. This sum includes the contribution made by the United States to international agencies such as FAO, WHO, and UNICEF, but by far the largest part of it has been spent under bilateral agreements between the United States government and recipient countries.

The aid given has included technical assistance in improving agricultural production and in developing agricultural extension and health services. It has also included the sending abroad of large quantities of food. Part of this food has been donated, and part has been made available on special terms such as reduced prices, long-term credits, or accepting payment in the currency of the receiving country.

The use of United States surplus agricultural commodities for foreign economic aid was made possible by the enactment of the Agricultural Trade Development and Assistance Act of 1954 (commonly known as Public Law 480). This law authorized the donation of surplus foods to UNICEF and to private re-

lief agencies for distribution abroad through the regular programs of these agencies; the use of these surplus commodities to help meet various temporary emergency situations such as famine, occasioned by droughts and floods, and to support some special feeding programs; and the sale of these agricultural commodities for foreign currencies provided such sales will not interfere with normal world markets. The foreign currencies obtained from such sales can be used for a variety of purposes in the recipient country, including loans for economic development, market research, and the development of research programs in the fields of agricultural utilization, plant and animal husbandry, forestry, and nutrition.

In the first four years of the act—through June 30, 1958—exports of surplus foods donated to international organizations, such as UNICEF and nongovernmental agencies such as CARE and Church World Service, totaled nearly $650 million. The chief items were dried skim milk, cheese, wheat flour, and corn meal. About $350 million worth of commodities was exported to help meet famine or other emergency situations.

In addition, surplus agricultural commodities which were worth $2.54 billion at market value were sold for foreign currencies. Agreements were signed with 37 countries. The largest programs were those with India, Spain, Yugoslavia, Pakistan, Brazil, Italy, Turkey, Japan, and Korea.

The equivalent in foreign currencies of about $1.5 billion of the proceeds of these sales has been earmarked for loans to promote economic development and multilateral trade. The use of local currencies for financing research is a new development, and up to the present time no nutrition research projects have been carried out with Public Law 480 funds. However, the possibility exists and opens up new avenues for the future.

Outlook for the Future

Large as is the sum spent on technical programs by the United States and other countries, either individually or through international agencies such as FAO, WHO, and UNICEF, it goes only a small way toward solving the food problems of the less developed areas. It is likely that countries like India, Pakistan, and Ceylon will continue to be dependent on imports of food grains for some years to come. At present, the countries producing a surplus of food grains can make good the shortages. How far this can be done over a long period, only time will tell. Besides the need to increase agricultural production for direct consumption, there is need to increase purchasing power by the expansion of nonagricultural enterprises.

There are thus problems both at hand and ahead in the race between population and food production. Recently, proposals from B. R. Sen, director-general of FAO, and from President Eisenhower have focused attention on the continuing problem of hunger. The President has suggested a "Food for Peace" program, and Mr. Sen has asked that a particular year be designated as the period for a world-wide concerted and concentrated effort to free the world from hunger.

Man has not yet put his best efforts to work in the fight against hunger. However, this is an age of science and technology, surely means can be devised to feed mankind far into the future.

Summary

Statistics on world food production and population indicate that production is increasing at an annual average rate of about 2 per cent, while the rate of population increase is about 1½ per cent. However, the greatest increase in agricultural production has taken place in the technically advanced countries.

More than half of the world's population still subsists on diets inadequate for health.

Countries where food supplies are inadequate must not only increase food production, but must increase the purchasing power of the population by the expansion of nonagricultural enterprises.

Although large sums are being spent on technical programs by the countries individually, or through international agencies such as FAO, WHO, and UNICEF, the food problems of the underdeveloped areas have not yet been solved.

Man has not yet made a world-wide concerted effort to fight hunger, using modern scientific and technological findings.

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This article is a summary of the papers presented before the Food and Nutrition Section of the American Public Health Association at the Eighty-Sixth Annual Meeting in St. Louis, Mo., October 29, 1958.