spread and easily recognizable deficiencies as it is in the more subtle effects of borderline inadequacies.

The single most important potential benefit of FPC in the United States is providing a low-cost animal protein source for low income groups, to free more income for purchasing other needed goods and services.

Much more serious protein deficiencies exist in many countries of the world, particularly in the less developed areas.

It has been estimated that each of the more than three billion people alive today requires about 70 grams of protein per day to remain healthy. A growing child requires 2 grams of protein per kilo of body weight, and that an adult requires 0.35 grams per kilo of body weight. Of the required 70 grams, nutritionists agree that about 40% or 28 grams should be protein of animal origin. According to the United Nations Food and Agriculture Organization, two billion of the world's population receive less than half of this required amount. About 30 million additional tons of animal protein, or about 180 million tons of animal flesh meat, are required to satisfy fully the animal protein requirements of the present world population.

The FAO document, *Third World Food Survey*, states that, if the world population were to increase according to the "medium" United Nations projection for 1975, world food supplies must be increased by over 35% merely to sustain the population at its present unsatisfactory level of diet. If a reasonable improvement in the general level of nutrition is to be achieved, world food supplies must be increased by over 50% and food supplies containing animal protein increased by 60%. By the year 2000, using the same world population growth projections, food supplies must be trebled and animal protein supplies must be increased approximately 4.5 times.

*Assumptions and constraints*

We must assume that with the increasing world population all sources of protein must be utilized. To two billion people in the world, hunger is a stark reality of chronic malnutrition, resulting not only from a lack of food but also, and most especially, from a lack of food of sufficiently good quality. By and large, the nutrient factor most lacking in deficient diets is good-quality protein. Accordingly, a great search has developed all over the world for protein sources that can be processed into concentrated and convenient products. These protein products must be inexpensive and, most important, must be suitable for use as food supplements that will not change the taste and other characteristics of the products to which they are added.

For these reasons it has been concluded that it is vital to investigate methods of harvesting the vast food resources of the oceans and inland waters. The objective was to develop processes that would make the protein from fish available to those who need it in an acceptable form at a price they could afford. It was realized that fish, available is vastly larger volumes than currently harvested, is a food of the highest nutritional value but underutilized for human nutrition, because of its tendency to spoil rapidly and because no satisfactory and inexpensive methods of preserving the raw material in a palatable form had been developed.

The idea to produce a fish protein concentrate as an inexpensive protein food supplement is by no means new, since private industry, government, and international organizations have sought to develop satisfactory methods of production.

Much valuable information had been developed but could not be translated into action programs for a number or reasons: technical failures delayed practical development on some occasions; at other times the protein concentrate proved to be unstable or unacceptable to the ethnic groups for which it had been intended. Sizable markets that might stimulate industry action were not anticipated. One of the most important obstacles was, however, the attitude of the U.S. Food and Drug Administration, which required proof that fish protein concentrate made from whole fish was safe, nutritious, and wholesome. Until the use of whole fish was approved by the Food and Drug Administration, no fish protein concentrate produced from this raw material could officially be sent overseas, and no foreign manufacturers would produce fish protein concentrate for fear of criticism that a food not good enough for Americans could be deemed suitable for people in developing nations.

The interest shown by the industry in FPC accelerated rapidly with the enactment of the Fish Protein Concentrate Act and approval by the FDA. The interest ranged from that of becoming a primary processor to becoming a contractor for