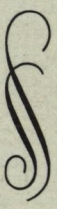
Food for Tomorrow:

The Role of the Petroleum Industry



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The Role of the Petroleum Industry

By John E. Swearingen

Let me say first that the matters before this symposium are of a deadly serious nature. From all the evidence at hand, we have before us in the remaining years of this century an escalation in food demand of dimensions which are so great as to be difficult to grasp, and which do not at the moment seem likely to yield to any readily apparent solution.

Before commenting on the role of the petroleum industry in the process, let me try to outline some of these dimensions, as background for the technical papers which will follow.

At a national meeting of this Society in 1964, Dr. Raymond Ewell stated that, "The food-population problem seems likely to reach such enormous proportions by 1975 that it will dwarf and overshadow most of the problems and anxieties which now occupy our attention, such as the threat of nuclear war, Communism, the space race, racial problems, unemployment, Berlin, Vietnam, the Congo, Cyprus, Cuba and the like. These current problems will fade into the background as the enormity of the world food problem impresses itself on the western world."

Not a great deal has changed since that dramatic prediction was made, except that we are now two years closer to 1975 and only 34 years from the end of the century. I would say that some progress has been made, in terms of a growing public realization that the problem is both great and immediate.

For fairly obvious reasons, starvation and famine have tended to seem remote in this country. To an American making his way through the fantastic abundance of a supermarket, it is difficult to grasp the full meaning of empty rice bowls in Asia—generation after generation. After all, we live in a country in which annual per capita consumption of beef alone has risen by 32 pounds within ten years.

Through an accelerating technology and heavy capital investment, American agriculture has become one of the most efficient and productive industries in the nation, with the result that one farm worker produced enough food last year for 30 people. By 1975, his efforts may support as many as 40 people in urban areas. Just since World War II, we have witnessed a remarkable 50 per cent gain in domestic food production, while farm employment fell over 40 per cent.

PROGRESS IN AGRICULTURE

The dramatic contributions made by agriculture to our national well-being have been largely overlooked by a public enjoying record prosperity. It has been calculated that we currently spend about $90 billion a year on food in this country —or less than one fifth of our national income— and we are the best fed nation on earth. Our household pets receive better nourishment than most humans elsewhere.

By comparison, the United Nations estimates that Russia is forced to devote 50 per cent of its national income to food. If we were faced with the same necessity as the Russians, this means that an additional $160 billion a year would have to be diverted from the purchase of television sets, automobiles, encyclopedias, vacations, medical care, and everything else we now consume with such abandon.

Agriculture, in other words, is a keystone of our prosperity—not only through its own vast

output of food, but through its supply of raw materials for other industry, and by virtue of providing itself a major market for such basic products as steel, oil, rubber, and machinery. This is often forgotten.

Most Americans have been aware of the huge surpluses of grain and other agricultural commodities which have piled up under a series of federal farm programs, and aware also of the considerable amounts of food we have been supplying to other countries under various aid programs. Surrounded by visible evidence of abundance, a number of people have come to assume that we probably could, if necessary, somehow feed the world.

Any complacency on this score among informed people has now been fairly effectively shattered by the phenomenal growth in population throughout the world and the increasing attention given to it. In actuality, there would be a very challenging food supply problem over the next few decades even if world population were to remain static.

TWO-THIRDS OF WORLD UNDERFED

Of the estimated 3.2 billion people on the globe today, the greater proportion are already underfed. According to a government task force, about 70 per cent of the children in less developed countries—where most of the earth's children live—are already undernourished or malnourished. While Americans in great numbers display concern over ways to cut down their caloric intake in order to maintain youthful appearances or for health reasons, two-thirds of the people on earth do not have enough energy to carry out their daily tasks effectively because they are undernourished or on the border of starvation. It would be a tremendous undertaking simply to bring the diets of the present inhabitants of the world up to levels considered adequate by medical experts.

As we all know, however, what we are actually faced with is far more ominous—namely a world population which is on its way to reach or exceed 7 billion, more than double our present level, within the lifespan of last year's college graduates.

Needless to say, no one expects actual food shortages in the United States. In addition to the gigantic capabilities of our agricultural industry is the fact that our birth rate of 20 per 1,000 population is relatively low, compared with much of the rest of the world. Nevertheless, even in this country, there is little argument that our population is going to increase to over 300 million within a few decades. Some experts think an increase to 400 million is more likely. Whichever view one subscribes to, we are looking toward a staggering population increase within our own borders within 34 years.

THREAT TO LIVING STANDARDS

The implications of this kind of growth are many and far-reaching, and beyond the scope of treatment here; some of the more obvious are worth noting, however. At this rate we have the prospect within a few decades of a near doubling in demand for food, housing, education, services, and every other element which comprises part of what we call the standard of living in the United States—simply to hold our own.

This is particularly serious when taken in the context of the rapid urbanization which we have undergone. The average density of Colonial America was one person per square mile. Manhattan today has about 70,000 per square mile. Yet the population buildup in metropolitan areas continues steadily, despite the fact that the problems of our major cities are already so great as to be termed insoluble by the more pessimistic.

According to some forecasts we are heading straight into a period of steady erosion of the quality of American life, under the impact of

sheer growth in the number of people to be provided for, as problems multiply, public services decline, and tax rates move to levels which will make those of today look paltry by comparison.

If such developments are causing concern in the most prosperous nation in the world, and one growing in population at a relatively modest rate, what is the outlook for the countries of Asia, Africa, and Latin America where life is already lived largely on subsistence terms and where the greatest population growth is taking place?

GROWTH PATTERNS UNBALANCED

The growth pattern is unmistakable. The projections show the lowest growth rates in the more highly developed countries. For Western Europe, the anticipated growth from 1960 to 2000 is 47 per cent; for the U.S.S.R., 90 per cent; for Oceania, 94 per cent; for North America, 97 per cent. Yet the increase anticipated for Asia is 149 per cent; for Africa, 166 per cent; for South America, 183 per cent; and for Central America, 205 per cent.

Moreover, the rapidly growing underdeveloped areas already have most of the people. Asia alone contains over half the human race. The children under 10 years of age in China outnumber the entire population of the Soviet Union today. Continuation of present trends in India will mean a population increase there from 432 million in 1960 to 1.2 billion by 2000. By the end of the century, the underdeveloped regions of the globe will contain over 80 per cent of its total population.

PRESSURE ON HUNGRY AREAS

As all of you know, these are also precisely the areas of the world unable to feed themselves today. In fact, their per capita food output has

actually been moving downward for several years. We have all seen economic development programs in Latin America and elsewhere completely frustrated as population increases outran hard-won gains in GNP, and the most strenuous efforts to improve the people's lot wound up with actual declines in living standards.

It is worth noting that some of these pressures on the underdeveloped areas are to a considerable extent of rather recent origin. Prior to the second world war, many of these countries were actually agricultural exporters. The turnaround began in the 1940's, with progressively sharper reductions in death rates under the impact of DDT, penicillin, antibiotics, and other life preserving techniques. In consequence, by 1961 death rates in some 33 countries—including some in every stage of development—fell in a comparatively narrow range between seven per thousand and twelve per thousand.

Yet what we have seen is only a foretaste of the growth ahead. For very many of these countries, the arithmetic of population seems to say that goals of becoming industrialized threaten to be supplanted by the objective of sheer physical survival.

NEW LOOK AT GOVERNMENT POLICIES

Growing recognition of these facts has led, among other things, to a new look at government agricultural policies. The initial "Food for Peace" program established by the United States in 1954 provided food for 100 million hungry people in 100 nations, and succeeded in reducing government stockpiles accumulated by the Commodity Credit Corporation, but it made no lasting contribution to solving the basic problem of food shortages in the receiving nations. Too often it simply gave the receiving governments an excuse to postpone agricultural action on their own part, or left them free to devote their resources to building unneeded, status-symbol industrial facilities, airlines, super-highways, and lavish public buildings.

The new "Food for Peace" act now on its way through the Congress recognizes this failure, and it also recognizes—despite any vague ideas either we or the recipients of our aid might once have cherished as to our ability to feed the world—that this is simply a physical and economic impossibility.

This is not to say that we propose to abandon direct food aid. Quite the contrary; in fact it would be expanded. The new law would permit deliberate production of food in the United States to feed the hungry in other nations, rather than limiting such help to surpluses accumulated under various farm programs designed to restrict production.

EMPHASIS ON SELF-HELP

However, the new proposal contains other significant departures—by placing heavy emphasis on self-help and efforts by the recipients to control their own population growth.

In the words of the House Report on the bill, the measure:

> "Recognizes for the first time, as a matter of U. S. policy, the world population explosion relationship to the world food crisis, by providing that the new food-for-freedom program shall make available resources to promote voluntary activities in other countries dealing with the problem of population growth, and family planning . . . The committee has taken these factors into consideration, in placing emphasis upon providing food for those countries where the governments and people are trying to improve themselves, particularly in achieving self-sufficiency in food production. The committee feels that the United States would do a

disservice to nations and to people by encouraging a belief that America can supply limitless amounts of food and fiber in all the years ahead, without any effort on their part."

This approach seems to be considerably more realistic and promising than the one we have been following. Whether it comes too late to do much good is another question. Had it been adopted in 1954, we would know more about the answer.

The record over recent years is certainly not one designed to generate optimism. Agricultural aid is only one aspect of a larger effort. Within the past ten years, the so-called "rich" nations have directed a monumental $50 billion-plus in foreign aid into the "poor" regions—not to mention an additional $30 billion in private capital. The announced objective was economic development.

When the 15 nations providing the bulk of this aid came together last July for a reappraisal, the atmosphere was one of universal discouragement. Despite assistance on such a scale—which beyond doubt did help the recipients very greatly—the fact remained that economic growth in the undeveloped regions as a whole was actually less over this period than in the preceding decade.

THE THREAT OF WORLD FAMINE

Meanwhile, during the interval in which nearly everyone—donor and donee alike—was mesmerized by rapid economic development as the solution, population growth has been steadily changing the rules of the game. As a result, we are now waking up to the fact that we are on the doorstep of the worst famine in world history. There seems to be more expert debate—and more expert dissension—as to whether we have enough time to avert the catastrophe which is looming up ahead than on any other aspect of the predicament.

Some see the battle already irretrievably lost, and the predictions of Thomas Malthus about to be verified—with a vengeance. Four Nobel Laureates warn of a new Dark Age descending upon us. Others see hope through redirected massive infusions of capital and technology from the West into the underdeveloped areas, through the spread of birth control, and through new food sources. Even the more sanguine appear convinced that we have very little time to arrest the problem, and that it will take efforts on a scale which will dwarf any now under way.

Since I am not expert in these areas, I will not attempt any judgments. Even to the layman, however, it is becoming clear that our situation is grave. Preservation of anything approximating stability and progress in a world in which most of the inhabitants are at the point of physical starvation is an impossibility—especially in a world now linked by global communication and transportation, and in which the have-nots are already militantly demanding more of the world's bounty.

PETROLEUM'S CONTRIBUTIONS

This is not a pretty picture, I will admit, but I think all of us would agree the facts hardly lend themselves to optimistic treatment. Let us turn now to something closer to our purpose here, and examine the role of the petroleum industry, and what kind of positive contributions it may be able to make to possible solutions to the broad problem. Since the papers which follow will deal in detail with some of these contributions, I will limit myself to general observations.

The partnership between petroleum and agronomy in this country is one of long standing, and it has become closer with the passage of time. In the early days of the petroleum industry, my own company was instrumental in laying the foundation for mechanized agriculture throughout the middle west through a network of bulk plants and tankwagon delivery of petroleum products directly to the farms.

Since then, agriculture has grown into the petroleum industry's major U. S. customer—for products ranging from fuels and lubricants to pesticides and fertilizers. As the cornucopia shows, it has been a fruitful partnership. Through research, improved products, better methods, and introduction of new farming techniques, we are working constantly to make it even more fruitful.

But the petroleum industry's revolutionary contribution from the outset was provision of the low-cost energy which—for the first time in history—replaced manpower and animal power on the farm.

SUPPLYING ENERGY IS BASIC

If you ask what above all else the oil and gas industry can do to help us to cope with the population and food problem, the answer is rather unexciting: it is to keep on doing its basic job of supplying energy. But unless our industry does continue to perform successfully in this capacity, we might as well forget about other approaches.

If the underdeveloped nations are to have any chance, however remote, of dealing with their population problems, they are going to have to depend on the leadership, the capital, the know-how, and the charity of the developed West, plus Oceania. And the developed West itself is shrinking in this regard. Under the impact of dogmatic application of Communistic doctrine, the U.S.S.R.—although classified as a developed country—has managed to convert some of the world's great agricultural regions into second-rate producers, and is itself forced to import grain to feed its own people.

Be that as it may, any solutions are going to have to stem from the industrialized nations—all of which are heavily dependent on petroleum energy. While oil and natural gas consumption is highest in the United States—accounting for over 70 per cent of total energy consumption—

Western Europe, Japan, and other major free-world countries are fast following in our footsteps. By 1975, oil demand in Western Europe will exceed that in the U. S.

What this means is that any lessening in the flow of petroleum would weaken the economies of the very countries which hold in their hands the keys to salvation for the rest of the world. If the flow of oil were to stop, the entire economic system of the West would collapse. Needless to say, a considerable part of this petroleum energy flow goes directly into agriculture, and is essential to the food-producing abilities of these nations themselves.

USING PROVEN TECHNIQUES

Looking further ahead, and looking more specifically at the underdeveloped areas, it is reasonable to conclude that this same role will have to be played again, on a wider scale. World food supplies are unlikely to increase at the needed rates in these areas without application of techniques similar to those proven so successful in the United States—including mechanization. Here again, it is essential that the petroleum industry be prepared to supply energy and lubricants. This process has already begun, of course, with the establishment of world-wide refining facilities and the development of world-wide markets.

There are other inevitable benefits generated by the global search for oil and gas, its development, and the movement to market. One of the more obvious is heavy capital investment in underdeveloped areas. Through investment and royalty payments, the petroleum industry assists nations across the world to finance development programs of their own and provides foreign exchange for food purchases and a host of other purposes.

At the same time, the world is being pressed hardest at the moment for rapid solutions to the

problem of buying time, while longer range solutions can be worked out. In this sense, mechanization is in the longer-range category. If we are trying to come up with answers which can show significant results in something like ten to 15 years, widescale mechanization is out of the question so far as the exploding underdeveloped world is concerned.

INCREASING YIELDS WITH FERTILIZERS

There are at least two other areas in which the petroleum industry can make a more immediate positive contribution. One of these is in fertilizers. For the near term, the bulk of increased world food production will have to come from higher yields, and fertilizers are generally considered to be the single most important yield-increasing input.

While no one anticipates yields of the kind now accepted as common in the West—through intensive use of fertilizers combined with hybrid seeds, mechanization, and weed and insect control—the effectiveness of fertilizers even in developing countries has been fairly well established.

Between 1961 and 1964, the Food and Agriculture Organization conducted 45,000 field demonstrations in 15 underdeveloped countries, and about 20,000 additional tests per year are going on. Some have yielded negative or marginal results, particularly where local plant strains would not respond to treatment. However, significant yield increases were obtained in most instances, with the value of increased production averaging considerably more than the cost of fertilizer used. In summarizing the results, the FAO concludes that when farmers in developing countries use fertilizers, the results will be generally good even without improved farming methods. In most of the underdeveloped countries, FAO estimates that 100,000 tons of fertilizer nutrients properly used is equivalent to about 1.1 million acres of land added to production.

In recent years, the petroleum industry has emerged as a major producer and supplier of fertilizer in the developed areas, and is expanding its efforts throughout the rest of the world. Despite these efforts, and those by the chemical and other industries, however, there is no indication that enough new capacity is planned to begin to close the gap between that in existence and what will be needed. *Chemical Week* has estimated that Asia, Africa, and Latin America must increase use of fertilizers from about 4 million tons per year today, to 15 million tons per year in 1970 and 30 million tons in 1980, to feed the expected populations involved.

There are many grounds for reservations as to the speed with which fertilizers can bring about solid results—even after they become available. These include the necessity for education of farmers in proper usage; the creation of adequate distribution facilities; provision for extension of farm credit; and the development of orderly markets for farm products. All of these are difficult, time-consuming, and costly deficiencies to overcome.

THE ROLE OF PRIVATE CAPITAL

Another of the principal barriers to more rapid development of new facilities in underdeveloped nations continues to be a failure of the governments involved to recognize that their goals are unattainable without the help of private foreign capital and technology and that these are simply not going to be forthcoming in significant quantities until they are willing to create a climate which will attract foreign investment. In some instances, single-minded application of socialist doctrines has effectively sealed countries off from badly-needed outside assistance. In others, extreme nationalism and sprawling bureaucracy have stood in the path of progress.

Some improvement in this regard seems to be forthcoming. Indeed, it would be amazing if it were not, in view of the stakes involved. As a

result of a more realistic recognition on the part of the Indian government of some of the imperatives faced by private investors, my own company and a number of others have now agreed to undertake major fertilizer ventures in that country.

SYNTHETIC FOODS FROM PETROLEUM

The second important further area in which the petroleum industry may be able to play a significant role has to do with synthetic food sources. Despite the many—and deeply ingrained—cultural preferences for certain foodstuffs we can find around the world, enough research has been done to demonstrate that no specific foods are actually required by the human body. It is quite possible to synthesize a series of chemically-known substances adequate for nutritional needs, or to extract the same from natural, but unconventional, sources. The determining factor, so far as production is concerned, is one of economics. A number of approaches have been successful technically, but are too costly to be practical.

It now appears that a major contribution may be in the offing through the production of high-protein food supplements from petroleum—both for human and animal consumption. A number of companies, including my own, have been investigating these possibilities. An extremely important aspect of this approach is that it is based on a raw material which is both widely abundant throughout the globe and low in cost by comparison with alternative protein sources. From the work done thus far, it seems that both liquid hydrocarbons and natural gas would be adaptable to processing.

Since you are going to hear a paper on this subject later, I will not go into specifics. Should this approach be successfully worked out, however, we might have here a contribution to mankind's food needs which could ultimately rival that made by our industry when it replaced muscle power on the farm with energy from petroleum.

A TURNING POINT IN HISTORY

In concluding, let me say that the challenge posed by the unparalleled increase in population ahead cannot be minimized. It appears we are approaching a turning point in the history of civilization.

It would be ironic if—at the moment we are successfully reaching out toward the stars—we were to perish through inability to manage our affairs on earth.

Quite certainly, the agricultural and petroleum industries of this country are destined to play a significant part in the ultimate outcome.

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