

THE ROCKEFELLER FOUNDATION

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THE NATURAL SCIENCES

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June 21, 1951

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Agriculture*

Dear Chester:

I am transmitting to you herewith a statement, with recommendations, concerning The Rockefeller Foundation and Agriculture. In a formal sense, this is a statement from the Advisory Committee for Agricultural Activities, consisting of Dr. Stakman, Chairman, Professor Bradfield, and Professor Mangelsdorf. But in the preparation of this statement there has been active collaboration not only between these three men, but also between a larger group which includes Dr. Harrar, Dr. Miller, and myself.

It is my intention that, in the near future, I will be giving you another statement, prepared entirely from the point of view of the division of Natural Sciences, but relating to the same general subject.

Sincerely yours,

(Signed) Warren

Warren Weaver

Mr. Chester I. Barnard, President
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Enclosure

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THE WORLD FOOD PROBLEM, AGRICULTURE, AND THE ROCKEFELLER FOUNDATION

I. INTRODUCTION

Britain's last reigning queen died in 1901, but the Victorian period continued on until 1914. In those days the world seemed a reasonable one. There had been no major wars for some four decades. Radio and the airplane had not yet destroyed time and distance. Local difficulties remained local; and only the occasional prophet dreamed that fierce and global tensions would some day have their ultimate cause in the conflict between population growth and unequally distributed and inadequate natural resources.

What was the enemy of mankind in those untroubled years just after 1900? The answer was obvious. It was disease.

Medicine was just reaching the point where it could deal successfully with the great scourges - yellow fever, typhus, hookworm, malaria, etc. If imaginative and able men asked, in that period from the turn of the century to World War I, how to serve the welfare of mankind throughout the world, it was very natural that their answer was: fight disease.

The Rockefeller Institute for Medical Research was founded in 1901; the Rockefeller Sanitary Commission in 1909; and The Rockefeller Foundation - with its great initial emphasis on public health and medical education - in 1913. As one looks back, he sees how logical and natural, indeed how almost inevitable, was this emphasis on the medical sciences.

Whatever our present era will eventually be called, the name must indicate a world wholly changed. What now are the great enemies of the welfare of mankind? Hunger, the incapacity of the hungry, the resulting general want, the pressures of expanding and demanding population, and the reckless instability of people who have nothing to lose and perhaps something to gain by

embracing new political ideologies designed not to create individual freedom but to destroy it - these seem to be basic dangers of our present world.

It is the thesis of this memorandum that The Rockefeller Foundation has, at the present time, a great opportunity to serve the welfare of mankind through activities in agriculture; and that this opportunity is, for our present world, as pressing and important as was that opportunity in medicine which was so clearly seen and so effectively seized, some forty years ago.

II. AGRICULTURE IN THE MODERN WORLD

To understand the role of agriculture in present-day human affairs, one must glance briefly at its history. Agriculture is a relatively recent human activity. Man has lived upon the earth at least a half million years, spending most of his time during that period in the never-ending search for his next meal. The invention of agriculture, occurring some ten thousand years ago, completely altered man's mode of life and established new patterns of human behavior. The transition from a food-gathering to a food-growing economy created for the first time in man's history an assured and stable food supply. Agriculture made it possible for a small fraction of the population to produce food for all. The result was leisure. Leisure for pottery-making and weaving, leisure for the development of other arts and crafts, leisure for contemplation and invention, for the development of a rich and rewarding culture.

The invention of agriculture did not immediately result in great increases in population, but its subsequent improvement has done so, and has created the potentialities for still greater increases. The practice of agriculture has in fact permitted more people to live on a given land area than had ever lived there before. The area of the United States, for example, which

now supports more than 150,000,000 people, previously maintained a food-gathering Indian population, in equilibrium with its natural food resources, of approximately 750,000.

Agriculture has, of course, been only one of many factors in population growth. Industrialization, which taught men to exploit the fossil fuel resources of the world, was a second. The application of public health measures, which has drastically reduced natural death rates, has proved to be a third. These three factors have combined in our generation to create an unprecedented situation in which a population already outrunning its food resources is still increasing at a fabulous rate. The problem of population and food is no longer one of the future. It is upon us now. The problem of food has become one of the world's most acute and pressing problems; and directly or indirectly, it is the cause of much of the world's present tension and unrest.

There is tragedy and danger in human hunger and the resultant suffering. Hunger is a powerful enemy of peace. There is a growing appreciation of the relation of subsistence to health and to human attitudes; to friendly relations or tensions between peoples; to peace or war.

The establishment by the United Nations of the Food and Agriculture Organization, and the emphasis placed on "food and people" by UNESCO are instances of recognition of the problem and of intent to do something about it. One of the purposes of President Truman's Point IV Program is to improve food production in underdeveloped countries. Unfortunately, however, concepts of needs, methods, and procedures in these relatively young organizations are still somewhat nebulous and limitations of trained personnel are serious, so that there unfortunately is little hope that they can function effectively

enough and soon enough to meet the situation. There is still acute and urgent need for immediate and intelligent action. Whether additional millions in Asia and elsewhere will become Communists will depend partly on whether the Communist world or the free world fulfills its promises. Hungry people are lured by promises, but they may be won by deeds. Communism makes attractive promises to underfed peoples; democracy must not only promise as much, but must deliver more.

The Western democracies are handicapped because Asiatic and other underprivileged people attribute their present plight to the domination of the capitalist colonial system, and resent the political and racial discrimination under which they have lived. These are handicaps which only effective action can overcome. In this struggle for the minds of men the side that best helps satisfy man's primary needs for food, clothing, and shelter is likely to win. Philosophical subtleties and pious platitudes are ineffective substitutes for bread and milk in the minds of hungry and uneducated men. The philosopher Seneca, more than 2,000 years ago, saw clearly that "A hungry people listens not to reason, nor cares for justice, nor is bent by any prayers."

There are those, undoubtedly too pessimistic, who believe that the problem of furnishing basic necessities is essentially insoluble and that the world must resign itself to the inevitable consequences of the Malthusian law: ever-increasing poverty, ever-recurring famine. Some of these pessimists question the advisability of giving any help at all to people in underdeveloped and overpopulated countries, on the ground that better food and health would probably result in further increase in population. There is much evidence, however, indicating that this will probably be only a temporary effect. A higher standard of living in the long run usually results in a reduced birthrate,

and improvements in agriculture are among the first essential steps in the improvement of the living standards of a country. People who are well fed are usually more efficient, vigorous workers. As the efficiency of agriculture is improved, more workers can be spared for making other needed improvements in transportation, manufacturing, sanitation, housing, clothing, education, etc. After the first essential steps are taken in these fields, agriculture can take another step forward because of the interdependence of all phases of the economy of the modern nation.

Others among the pessimistic assume that the present levels of agricultural productive efficiency and of subsistence can be only slightly increased, and they conclude that the prospect for the future is alarming, if not indeed hopeless. Actually the food-producing capacity of the world is unknown. Modern statistics on world food production are continually being revised upward, as improved techniques result in increasing yields. It is probable that yields per acre will increase still further as scientific agriculture and the sciences which underlie agriculture continue to advance. And there are still large unexploited areas in the world that can be utilized at least for highly specialized agriculture, once the appropriate techniques have been developed.

The potentialities of modern agriculture are only beginning to be appreciated. Within the past century and a half there has been a most fruitful application of the techniques of science to the traditional methods of agriculture. The principles of physics and chemistry together with those of physiology and microbiology have been utilized in the study of the soil and in the maintenance and improvement of its fertility. The principles of genetics have been applied to the improvement of domestic animals and cultivated plants. Studies of mycology and entomology have given the agricultural scientist control

over plant diseases and pests and have enabled him to develop effective new fungicides and insecticides.

Agriculture has made more progress in the advanced countries of the world in this last century and a half than in all the preceding centuries of recorded history. During this period the percentage of population engaged in agriculture in the United States has declined from over 80 per cent to less than 20 per cent. The better half of these farmers, or less than 10 per cent of the population of the country, are producing 90 per cent of our farm products. An additional 10 per cent increase in the output of the better 50 per cent of our farmers would enable 10 per cent of our population to produce as much as we are now producing. This would free 90 per cent of our population for other services desired by modern man. Equally striking progress has been made in Western Europe. Farms are usually smaller and less mechanized. Yields per acre are higher but output per farmer is less.

In most of the underdeveloped countries, agriculture is in about the same stage as it was in the more advanced countries 150 years ago. Usually from 60 - 90 per cent of the population is engaged in agriculture. Farm wages are very low, often only 2 - 5 per cent of those in the United States. Crop yields and labor efficiency are both very low. As a result, basic food costs are so high that the average laborer cannot afford an adequate diet. In such a primitive agriculture the ravages of insects, plant diseases, and drought have free play. The use of commercial fertilizer, lime, green manures, and crop rotations is unknown. As a result the food supply varies widely from year to year. Inadequate transportation often makes it difficult to move food into deficit areas and aggravates the relief of famines.

The contrast between the efficiency and productiveness of agriculture in the more advanced countries and its primitiveness and inefficiency in the underdeveloped countries is one of the really disturbing factors in world affairs today. The seriousness of the situation is aggravated by the fact that these contrasting areas are in more intimate contact with each other than ever before.

Observers from all the underdeveloped countries report that a ferment seems to be working in practically all of them. This has been especially noticeable since World War II. Prior to that time many of these countries were very much isolated from the rest of the world and the masses of the people accepted their lot as inevitable. As a result of contacts with the more highly developed countries during and since the war their leaders are becoming conscious of the fact that there is a better way of life for them. The airplane and radio are constantly reminding them of this fact. Agitators from Communist countries are making the most of the situation. The time is now ripe, in places possibly over-ripe, for sharing some of our technical knowledge with these people. Appropriate action now may help them to attain by evolution the improvements, including those in agriculture, which otherwise may have to come by revolution.

All well-informed agriculturists are agreed that the potentialities for the improvement of agriculture in most of the underdeveloped countries are enormous. In many areas, because of the nature of the climate, two to four or more crops can be produced on the same land each year. If the farmers in these countries are taught modern scientific methods and given access to the materials which have come to be essential to modern agriculture, such as fertilizers, insecticides, fungicides, etc., rapid progress can be made. Experience in both

the United States and in the Foundation's agricultural program in Mexico has shown that, once momentum is attained, progress in agricultural improvement may be spectacular.

III. OPPORTUNITIES FOR THE ROCKEFELLER FOUNDATION IN AGRICULTURE

The problem of population and food offers both an opportunity and a challenge to an organization concerned with "the well-being of mankind throughout the world." However, in considering an expansion of effort in agriculture on the part of The Rockefeller Foundation, it is not sufficient to recognize food production as a leading world problem, nor simply to believe that agricultural activities can in both direct and indirect ways notably serve the welfare of mankind in the modern world. If we are to convince ourselves of the desirability of expansion of our agricultural work, it is necessary, in addition, to see that the opportunities are such as to fall specifically within the competence, the experience, and the practical possibilities of our Foundation. Among all the vast number of things in the world which are important and need doing, The Rockefeller Foundation must select opportunities to which it can hope to make a significant and characteristic contribution.

In this connection it should be recalled that the interest of the Foundation in agriculture is not new or recent, but traditional. When Mr. Gates wrote Mr. Rockefeller in 1905 a letter which presumably contained the original motivation for the creation of The Rockefeller Foundation, he suggested several fields in which a great philanthropic trust should operate. It is worth remembering that the first field named by Mr. Gates was "scientific agriculture." From 1906 to 1914 the General Education Board invested nearly a million dollars in a pioneering agricultural program of farm demonstration. This support, augmented from state and federal funds, resulted in more than

100,000 demonstration farms; and led directly to the present vast and highly successful agricultural extension service. The International Education Board worked actively in agriculture in the years 1923 to 1929. Agriculture has been a part of The Rockefeller Foundation thinking from the start, was actively supported in Europe for a period during the twenties, and has recently been developed in Latin America during the past decade. The activities in agriculture of the division of Natural Sciences during these ten years are not to be viewed as something outside of its normal scope, since agriculture is nothing more than the application of the principles of biology and the other natural sciences to the art of growing food.

In 1943, following a searching preliminary survey, The Rockefeller Foundation initiated an experimental agricultural project in Mexico as an operating activity. The objective was to improve the production of Mexico's basic food plants through plant breeding, the improvement of soil fertility, and the control of insect pests and diseases. The technique was to demonstrate what could be done through the application of modern scientific methods while training young Mexicans to understand and to apply such methods in their own country. It was estimated that such a program would require many years to produce significant results. The estimates have proved to be conservative, for now, after eight years, the Mexican Agricultural Program has already had its effect upon crop production. It has been demonstrated that the basic food plants of a country such as Mexico can be improved and that native personnel can be trained to participate effectively in such a program of improvement.

The success of the program in Mexico and the growing success of the recently established program of the same kind in Colombia can be largely attributed to two factors - the quality of the technical personnel, both national

and foreign, and the continuity of the programs. It has been repeatedly demonstrated by the experience of other agencies in a number of Latin countries that little lasting effect results from the use of temporary agricultural consultants imported into a country for only short periods. A much more effective procedure is to establish carefully planned and stably supported projects of limited dimensions, within whose reasonable scope definite success can be attained. On this established success one can then advance to additional projects, and thus create a steadily growing body of material, information, and trained personnel capable of functioning actively and durably in the improvement of agriculture. The role of the Foundation in such a program should be that of a catalyst promoting a reaction without becoming a permanent part of it.

The present opportunities for The Rockefeller Foundation in agriculture are twofold: 1) to apply its experience and resources in building up the agriculture in certain backward countries; 2) to promote the sciences which underlie agriculture in order to stimulate the application of new discoveries in these sciences to the advancement of agriculture.

The first opportunity is world-wide, but for practical purposes it is concentrated, although not confined, to this hemisphere. The problems of the Americas are of necessity common problems. Whatever affects any country in this hemisphere must inevitably affect the others. Since there is a distinct possibility that this hemisphere may become the world's principal refuge from Communism, Americans concerned with the preservation of free societies must, in their own enlightened self-interest and not motivated merely by generosity or sentimental humanitarianism, do everything within their power to raise the living standards of their neighbors in this hemisphere.

The agricultural programs in Mexico and Colombia have already attracted wide attention as one method of accomplishing this result. They have shown how the United States can export its technical skills to a friendly neighbor at relatively little cost. They have had an influence far beyond the boundaries of the countries in which they operate. Information and improved plant materials developed in Mexico have been made available to other Latin American countries; numerous visits have been exchanged with foreign scientists; and the program in Mexico has become a training center for young scientists from several other Latin American countries.

There are many ways in which the Foundation could become more widely helpful in Latin America, but none that appears more immediately promising than that of exploiting on a wider front the success of its present agricultural activities. The Mexican Agricultural Program stands as a hub around which future developments can be built. The experience gained in Mexico and the pattern of operation developed there can and should serve for operations elsewhere. The Mexican program should serve as a training center not only for American scientists later to be assigned to other countries, but also for young Latin Americans destined to return to their own countries.

This subject of training agricultural scientists for work in Latin America deserves special emphasis, for upon adequate training hinges the ultimate success of the entire program. The opportunities for training are numerous and diverse, and no useful type of training should be overlooked. The existing agricultural schools in most of the Latin American countries are far from effective and need substantial improvement. Much can be accomplished by sending some of the more promising young agricultural graduates from other countries to Mexico to serve as working apprentices in the Mexican Program. Still other

students can benefit from a course of study in the United States. But this is only half of the picture. Training is needed for North American agricultural scientists, not primarily in their special techniques, but to teach them how to employ these techniques to good advantage in countries and cultures other than their own. The Mexican Agricultural Program can be used for this purpose; but perhaps, in addition, one or more agricultural colleges in the United States should be encouraged to give special attention to preparing some of their most promising agricultural students for service in foreign countries.

Another important opportunity not to be overlooked lies in sending distinguished American and European agricultural scientists to Latin American countries on a term basis for teaching or research. As past experience has already proved, this would serve little useful purpose if it were done apart from other measures. But such men could make notable contributions to established and active agricultural programs. The Mexican Program, for example, has benefited greatly by the fact that its agricultural advisers have been more than advisers. All have participated actively in research and teaching in Mexico, and have helped to keep the Mexican Program in touch with recent advances in their respective fields. Other agricultural scientists, not on the Advisory Committee, could be advantageously employed in Mexico and other countries in this same fashion. A roster should be made of agricultural scientists who are well qualified in certain fields and who are available for special assignments in Latin American countries. Such men, too, require training, but primarily the kind of training which they would gain by actual experience in the field.

As was stated above, there is a second large opportunity for The Rockefeller Foundation in agriculture, over and beyond - or perhaps one should say underneath - the extension of existing agricultural knowledge into backward areas. We should also promote the sciences which underlie agriculture, and should aid in those fundamental advances which are necessary if agriculture is to keep pace with the world's demand for food.

For example, if the Foundation should embark upon an expanded program of improving agriculture in Latin America, it must sooner or later also assume a share of the responsibility for maintaining high levels of agricultural research in the United States, which, for the immediate future

at least, will continue to furnish the model for our neighbor countries. Since the United States already has an extensive and well-supported system of agricultural colleges as well as a vast research organization in the United States Department of Agriculture, it might be thought that this problem is one with which the Foundation need never concern itself. Unfortunately, this is probably not true. American agricultural scientists, like other applied scientists of this country, have shown themselves to be extremely skillful at applying theoretical knowledge to practical problems. They have been much less successful, and indeed many have been little interested, in creating a new body of theoretical knowledge upon which further technical advances can be built. The situation is rapidly becoming a serious one which is giving real concern to the more forward-looking workers in the agricultural colleges and in the United States Department of Agriculture.

It is possible, and indeed quite probable, that The Rockefeller Foundation could exert great influence upon research in agriculture by making occasional grants within the United States in the encouragement and support of really basic research. Such agricultural activity in the United States could operate on the principle that a project is of no particular interest to the Foundation if it is concerned primarily with the application of existing knowledge, but that it becomes eligible for consideration by the Foundation if it is concerned primarily with the advancement of knowledge in this area. Some effort might perhaps be made to invite applications in the second category. This proposal is a natural supplement to the Foundation's proposed objectives in Latin America. There the stress would be upon practical applications; in the United States the stress would be on those advances in pure science which would lay the foundation for future advances in the applied sciences.

Our discussion of agricultural opportunities has so far been confined to those of this hemisphere. These, we believe, take precedence over those in other parts of the world, but the latter must not be completely overlooked. Expansion in countries outside the Western Hemisphere could well be on an opportunistic basis. The methods might be different from those in Latin America and would vary from country to country. In India and Pakistan, for example, the difficulty is perhaps not so much the lack of competent scientists as the fact that their services are not utilized. Some need opportunity, and others need motivation. The same may be true of Japan. German agricultural scientists need equipment, facilities, and renewed intellectual intercourse with the United States and Canada. Japan and Western Germany are agricultural-deficiency countries. If they are to be outposts against Communism, spiritually and physically, some agency must help them to develop their agriculture.

There is a special problem in the Philippines, and perhaps special responsibility on the part of the United States to contribute so far as it can to its solution. It is not at all certain that there will be an opportunity to render help in the Philippines, but if there should be, it ought by all means to receive serious consideration.

IV. RECOMMENDATIONS

We are aware that the results of operations in agriculture, like those in public health, are sometimes dramatic and spectacular. Because these results are tangible and obvious, they have a natural appeal. Thus research in agriculture has a distinct tactical advantage when it competes for financial support with certain other fields of learning and application which may easily be of equal or even greater long-range value.

Recognizing this, we are not recommending that The Rockefeller Foundation engage in either an abruptly rapid or an unlimited expansion of its agricultural activities. But we are equally convinced that an expansion is now in order. The success of the Mexican Program has been so conspicuous, the opportunities for similar success in other localities are so numerous and attractive, and the needs are so basic and pressing, that some increased action is clearly called for. Therefore we submit the following recommendations:

- A) That a program in agriculture, utilizing operations led by Rockefeller Foundation staff as well as research, training, and developmental grants to other agencies, be recognized for Latin America.
- B) That within the United States there be no support of agricultural activities which primarily involve the application of existing knowledge, but that projects be considered for support which involve the acquisition of new fundamental knowledge applicable to agriculture.
- C) That for parts of the world other than Latin America and the United States, The Rockefeller Foundation adopt for the present an opportunistic attitude with respect to agriculture, not actively canvassing for opportunities, but studying such individual opportunities as arise.

We recognize that our recommendations could move forward under a wide range of financial support. We assume that this aspect of the situation would be the subject of discussions between the President, the relevant officers, and the Trustees. We assume also that the decisions regarding

suitable central-office personnel and other facilities are essentially administrative and would be made by the President of the Foundation with such advice as he wishes to seek.

Our recommendations are designed to suggest a broad general policy for The Rockefeller Foundation with respect to agricultural activities. Once a framework of policy has been adopted, detailed and specific recommendations for both its immediate and long-range implementation will be in order. Thus we would propose to proceed promptly and energetically with the recruitment of more United States personnel, and with the training of these men, in the Mexican and Colombian programs, for future service elsewhere.

In activating this policy of expanded effort in agriculture we would recognize the interdependence of improvements in health, education, agriculture, and other basic aspects of a country's economy and culture, and we would give priority to the relatively few situations where a well-rounded program of development seems most probable.

June 21, 1951