

THE ROLE OF THE POTATO
IN THE CONQUEST OF HUNGER



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I am deeply honored to be the 1990 laureate of the World Food Prize. It is with genuine feeling of both pride and humility that I accept this distinguished award. My feeling of pride is based on the knowledge that this award recognizes the contributions made by my colleagues and friends all over the world, working together for so many years. And I am proud to accept this award in their name. I feel humble because I am joining such distinguished laureates as those who have been honored in the 3 previous years, Dr. M. S. Swaminathan, Dr. Robert Ghandler, and Dr. Verghese Kurien.

At this time I am sure that all of us will join in expressing our appreciation to Norman Borlaug, whose inspiration led to the creation of the World Food Prize, and to the Council of Advisors and sponsors who have established and guided it.

And I wish to call your attention at this time to one very special person who has been a constant source of support and encouragement during my career. Not only has she travelled with me all over the world and shared the satisfaction of cooperating with our colleagues in so many countries, but she has created the home and family that have made my life so wonderful. Those of you who know her are aware of how vital she has been to whatever might have been accomplished. I would like to introduce this person who shares with me the honor of the 1990 World Food Prize, my wife, Ann Niederhauser.

In 1947 I began my career in international cooperation and development as the plant pathologist on a small team of scientists sent by the Rockefeller Foundation to Mexico to cooperate with the Mexican government in a national program to increase production of basic food crops in that country. This innovative program was one of the first ventures into international agricultural assistance. Under the early leadership of Dr. George Harrar, this Mexican agricultural program pioneered the establishment of other agricultural assistance programs throughout the world under the sponsorship of many agencies. The national wheat, maize, and potato programs developed in Mexico soon had regional and then international dimensions. A similar strategy was subsequently established to increase rice production and development in Asia, and these programs led to the creation of the first International Agricultural Research Centers in the 1960's.

I. INCREASING POTATO PRODUCTION IN THE DEVELOPING WORLD

The Mexican National Potato Program was launched in 1948. From the beginning this production-oriented effort emphasized collaboration with farmers, who applied both established and new technologies to improve potato yields. This successful national program was responsible for a six-fold increase in ^{annual} potato production in Mexico from 1950 to 1980. ~~_____~~ The value of the increase in annual potato production was over 10 times the total 30-year budget of the national potato program from 1950 to 1980.

in Mexico

This spectacular rise in annual production was due primarily to higher productivity (or production per hectare)

But the Mexican National Potato Program also played a vital role as an operating and training base in the development of national potato programs throughout the Third World. Using the same field-oriented approach that was proving so successful in Mexico, we worked with farmers, scientists, and decision-makers in the organization and improvement of potato production programs in many countries.

Over 180 scientists from developing countries participated in potato production and training activities based in the Mexican National Potato Program. The leadership personnel of national potato programs in 27 countries had the opportunity to visit Mexico and work in the field with their Mexican colleagues for periods of 6-12 months, including at least one complete growing season of the potato crop. Effective cooperation increased rapidly among these potato programs all over the world.

By 1956 an Inter-American Potato Program had been established, with the collaboration of the national potato programs throughout Latin America. And in 1961 the International Potato Program, based in Mexico and with international funding, was formed to stimulate increases in national potato production in many Third World countries.

The national potato program development in these countries followed a similar pattern :

1. Identification of program priorities and production restraints.
2. Emphasis on production-oriented research, and an intense cooperative effort to demonstrate improved production technology in farmers' fields.
3. Closer coordination between existing national institutions and personnel, in accord with their priorities, so as to promote more efficient utilization of scarce national resources.

Modest budgets and limited personnel obliged this International Potato Program to work with and through the national programs. In retrospect, these so-called restraints, both in resources and in personnel, required a cooperative production strategy that was directly responsible for the dramatic increases in the productivity and continuity of these national potato programs in developing countries throughout the world.

The need for institutionalizing this International Potato Program became apparent, and in 1971 the International Potato Center (CIP) was created in Lima, Peru. The existing International Potato Program and its regional components formed the operating base for this new Center. And during its two decades of growth, CIP has been distinguished by several


basic characteristics that were inherited from this International Potato Program that preceded it :

1. Modest headquarters.
2. Efficient use of contract research, using the strength and excellence of research institutions in the United States and Europe, as needed and appropriate.
3. Regionalization of programs, with emphasis on the building of strength and continuity in national programs.
4. Maintenance of a broad germplasm bank, in several locations, both to be utilized in current potato breeding programs and to be conserved for future needs.

The significance of this strategy in international cooperation and development is widely recognized today. In 1986, at the 20th Anniversary Celebration of the International Corn and Wheat Improvement Center (CIMMYT) in Mexico, Dr. S. Husain, chairman of the Consultative Group on International Agricultural Research (CGIAR), paid tribute to this "pioneering relationship between the far-sighted agricultural research program of Mexico and a small group of Rockefeller Foundation scientists. The entire CGIAR system owes its existence to the approach used in the Mexico-Rockefeller Program - that of scientists from different countries working together to solve major agricultural problems."

During the past 30 years, total potato production in the developing countries of the world has tripled. This is due to a 50% rise in the acreage planted, and even more important, to a 100% increase in productivity, or yield per hectare. In 1950 less than 4% of world potato production was in the developing countries. Today it is nearly 15%.

(Table 1). And the rate of increase for potato production in the Third World is greater than for any other major food crop.

The most accurate measure of the impact of successful national potato programs in certain countries is not only the significant increase in production that has occurred in the last few decades (table 2). There also has been a 70-100% increase in the annual per capita potato consumption in these five countries during the past 30 years. And even though potato consumption is still much lower than in Europe or the United States, the potato is becoming a much more important food crop in these countries, where it is now recognized to be a valuable ^{major} source of nutrients,  and is no longer considered to be merely an expensive vegetable.

This success story is the result of an international cooperative effort involving the potato farmers, scientists, and decision makers in national programs all over the world. All of them can take justifiable pride in this dramatic and increasing contribution that the potato is making to the world food supply.

II. PRECODEPA, A NEW STRATEGY IN REGIONAL COOPERATION FOR THE TRANSFER OF TECHNOLOGY

During the 1970's it was noted that the national resources available for agricultural research and development were very limited in many developing countries. It is often not possible to finance a complete national crop production program with all the necessary technical personnel and components. To alleviate the problems caused by this lack of funds and personnel, the PRECODEPA * project was launched in 1978 at a regional meeting attended by the representatives from Guatemala, Mexico, Honduras, Costa Rica, Panama, Dominican Republic, and the International Potato Center. Today there are 10 countries participating in PRECODEPA, with the International Potato Center as the eleventh member.

At the organizational meeting in Guatemala, each country listed the limiting factors to increasing potato production and productivity in that country. A number of the limiting factors, - such as good seed, late blight resistance, low-cost rustic storage, etc. - were common to several or all countries, and a regional project was organized to solve each of these limiting factors. Leadership for each of these projects was assigned to one of the collaborating national programs, which, with

* Programa REgional COoperativo DE PApa

international financial support, developed the personnel, research, and materials for the solution of this production problem. The research technology and training opportunities derived from these PRECODEPA projects were shared with each interested country.

PRECODEPA is governed by a committee composed of one representative from each participating country and from CIP. All regional activities are financed by international funds, which to date have been supplied by the Swiss government. Activities that are strictly national in scope continue to be financed by national funds.

Among the direct benefits to the participating national programs are increasing potato production and productivity, greater continuity in national program activities and personnel, and more efficient utilization of scarce resources.

PRECODEPA has been recognized as a very cost-efficient strategy for improving agricultural production and productivity in countries with limited resources, and has served as a model for similar cooperative programs in other regions of the world. Many of us feel that PRECODEPA could be the most important new development in the transfer of technology since the creation of the International Agricultural Research Centers.

III. PICTIPAPA, A NEW STRATEGY FOR THE CONTROL OF POTATO LATE BLIGHT

Although the significant potato production breakthroughs during the past few decades are well recognized, recently there has been a tendency for potato production to level off in many developing countries. There is an explanation for this apparent loss of momentum.

If the potato is to be grown more widely in the world, and realize more fully its potential as a food crop in developing countries, resistance to the late blight disease is essential. Wherever potatoes are grown under rainfall, the susceptible varieties must be protected by fungicides, which are expensive and often unavailable in many Third World countries. In some regions, farmers may try to escape late blight by growing the potatoes under irrigation during the dry season. But irrigated land is becoming increasingly expensive and scarce. Resistance to late blight is the obvious solution if the potato is to become a more important staple food in these countries, *and resume its rapid rate of expansion there.*

For more than a century since the late blight disease devastated the potato crop in Ireland and caused the tragic famine there, the search for a durable resistance to this plague has been frustrating and largely unsuccessful. In potato breeding programs all over the world, the story was the same. Soon after supposedly resistant potato cultivars were developed and released, they fell susceptible to new races of the causal fungus pathogen.

Early in the development of the Mexican National Potato Program, it was discovered that Mexico had some unique advantages for the study of this most important disease of potatoes. First, Mexico was the native home of the wild potato species that had been used world-wide in potato breeding programs as the source of late blight resistance. And second, Mexico was discovered to be the place of origin of the fungus pathogen, Phytophthora infestans.

The Mexican potato breeding program soon became a world center for the study of potato late blight, and for the development of potato cultivars with a durable horizontal resistance to this disease. The historic contributions from the Mexican-based research on potato late blight have greatly improved the chances for success in the world-wide search for the control of this disease through the use of resistant potato cultivars.

Today the Mexican National Potato Program has about 25 potato varieties with high levels of a durable resistance to late blight. Several of these varieties have been grown successfully for more than 20 years by subsistence farmers in the mountains of Central Mexico, and without the application of expensive fungicides. Other blight-resistant Mexican potato selections have been grown for a number of years in other Third World countries, such as the Philippines, Nepal, and Guatemala. These

Mexican cultivars have made a substantial contribution to the food supply in these countries.

There still remains an enormous unexploited potential for increased food production in many other countries of the developing world, through the expanded cultivation of blight-resistant potato cultivars. These new Mexican potato varieties represent the most promising plant materials for expanding world food production, since the short-stawed, rust-resistant wheats and the "miracle rice" varieties that launched the Green Revolution a few decades ago. The Mexican blight-resistant potato varieties could launch a new Green Revolution, which might be called a truly green revolution, since it would be accomplished with fewer chemicals, rather than more.

To help realize more of this potential contribution to world food production, in August 1990 a new international cooperative program was launched by the Mexican Ministry of Agriculture, with the collaboration of scientists from Poland, Netherlands, Canada, United States, Mexico, and the International Potato Center. This new strategy in international cooperation, called PICTIPAPA *, will promote projects of mutual

* Programa Internacional Cooperativo del Ilzon tardio de la PAPA

interest to the participants, and is open to interested institutions and scientists anywhere in the world. PICTIPAPA will provide new channels for funding and collaboration in the development of a world-wide control of the infamous late blight disease that has plagued potato production for so many years.

Among these projects is an international field trial for the testing, distribution, and multiplication of blight-resistant potato varieties throughout the world, and thus make them available to subsistence farmers in any country.

PICTIPAPA is also of vital interest to potato scientists and farmers in the industrialized countries of the world, where 85% of the world potato crop is produced. They are concerned because a new strain of the late blight pathogen has escaped from Mexico during the past decade, and has become established throughout the world. This new strain makes it critically important for potato producers in all countries to have new varieties with higher levels of a durable resistance to late blight. This can be most quickly and reliably accomplished in collaboration with the Mexican-based PICTPAPA program.

Much remains to be done, but there is more hope and optimism than ever, that this 150-year-old menace to world potato production can finally be controlled.

IV. THE CONQUEST OF HUNGER

The previous three World Food Prize laureates have reported on the dramatic breakthroughs made in wheat, rice, and milk production during the past few decades. These remarkable programs have resulted in major changes in world food availability. No longer are we facing frequent famines due primarily to a lack of food. Today we are assured that there is sufficient food produced to feed the world's population. But then we are told that there are more hungry people in the world today than 30 years ago !

It is obvious that merely having enough food produced is not an automatic solution to hunger. There are other vital problems that result in food shortages and hunger. But the fact that we do have an adequate supply of food does give us the opportunity to confront these problems. And hopefully we shall have the wisdom and time to solve them. Certainly there is no time for complacency.

Let us briefly identify two of these basic restraints that must be solved as we proceed with our efforts to provide the world's population with an adequate, nutritious diet.

1. Population Stabilization

It is significant that each of the three previous World Food Prize laureates emphasized the basic fact that any benefits from increases in food production will ultimately be nullified unless we can bring about world population

stabilization. Prime Minister Jawaharlal Nehru, when discussing several

of India's critical problems some 40 years ago, included the need for population stabilization among them. And then he added, "Population stabilization will not solve any of our preesing problems; but none of these problems can be solved without it."

In 1970, Dr. Norman Borlaug was awarded the Nobel Peace Prize for his leadership role in the Green Revolution. In his acceptance speech, in reply to some overly-optimistic comments that the problem of world hunger was solved, he stated, "If fully implemented, the Green Revolution can provide sufficient food for sustenance during the next three decades; but the frightening power of human reproduction must also be curbed. Otherwise the success of the Green Revolution will be ephemeral only."

We are now entering the third decade following ^{this} the prophetic statement. Today the world population is more than 5 billion. By the end of this century it will exceed 6 billion, and hopefully will be stabilizing by the 2100, probably at 12 billion. Also, it is important to realize that approximately 90% of this population of 12 billion in 2100 will reside in what are now called developing countries of the world.

Do our leaders have the information, planning skills, and determination to implement and enforce the policies and measures needed to reach population stabilization by the year 2100? During this next century, can we feed this growing population while establishing a sustainable agriculture that will preserve the quality of our environment? Will population stabilization be at a level consistent with what can be fed? Positive answers to these questions are urgently needed, because the world will not wait.

2. Food distribution

According to FAO estimates, approximately 20% of the population in developing countries are suffering from hunger. Yet the FAO also affirms that there is plenty of food produced in the world to feed everyone, and with some to spare. What is wrong?

The problem is one of distribution. It is beyond the scope of this brief talk to analyze the complex reasons why there is hunger in a country that can produce an abundance of food for its people. The causes may be economic, political, or social. But whatever factors that contribute to a lack of purchasing power (or poverty) in any sector of a society, are basic causes of hunger. This is equally true for any country of the world, developed or developing.

To conclude, I call to your attention that a great challenge faces the world today as we proceed into the next decade and the next millenium.

~~These are the great challenges to the world today as we proceed~~
How are we going to ~~toward the conquest of hunger~~ attain world population

stabilization during the next century, and produce adequate food for this population? How can we assure that food is available to all people?

To reach these goals will require a coordinated international ~~program~~ effort by dedicated leaders and their constituencies, who understand the critical relationship ^{between} of population stabilization and effective food distribution in the successful conquest of hunger.

Are we equal to this challenge? As an agriculturist who has worked in the fields of farmers in many countries for over 50 years, I do believe that we have the soils, water resources, climates, and technology to feed the world as it approaches population stabilization near the end of the next century. However, do we have the understanding, the dedication, and sense of urgency to cooperate in such a global program to feed more people, and to feed people more?

We are living now in one of the most exciting and critical periods in the history of mankind. As we approach the biologic limits for what this planet can support, we are also more aware that we are living in one world. And as citizens of one world, we must all work together to have this world without hunger, while conserving our environment and energy resources.

I ask again. Are we equal to this challenge?

