

Quentin M. West

## The Revolution in Agriculture: New Hope for Many Nations

Antonino Eldemida is a rice farmer in the province of San Isidro in the Philippines. He is a tenant on 12 acres of land. He is probably the first farmer to plant "miracle" rice. His yields more than doubled. He sold the new rice for 23 pesos (\$5.90) per cavan (100 lbs.). He bought an acre of land and a tractor; he sent two children to college. He improved his irrigation system as well.

This year there is a surplus of rice in the Philippines. The government has a lot of money in rice it bought last year and cannot export. It has not been able to support the price this year. Senor Eldemida only received 11.5 pesos per cavan this year. He still makes more money than with the old varieties, but some of the bloom is off the "miracle."

H. S. Grewal is a wheat farmer in the Punjab state of India. He is a retired army major and owns 30 acres of irrigated land. He adopted the new dwarf wheat 2 years ago. Yields increased more than 50 percent. He has replaced his Persian water wheel (operated by buffalo) with an electric pump. He has ordered a tractor, but it will take 2 to 3 years to get it.

The Punjab has produced a surplus of about 2 million tons of wheat the past 2 years which has helped feed the deficit areas in India. However, it took a long time to move it, and there was not enough storage. If the monsoon had not been 2 weeks late last summer, thousands of tons of harvested wheat would have been rained on.

It is important to be clear what today's world agricultural revolution is and what it is not. It is a tremendous accomplishment. It is a new hope for developing nations. It is not a total solution to the hunger problem, but it should make substantial additions to food supplies in countries where there have been food shortages. It should relieve the pressures to produce or to import grains to provide sufficient quantities of food and enable these countries to begin to plan for better quality of diet, including the livestock products, pulses, fruits, and vegetables.

Today's hope for hungry nations starts with their growing awareness of the necessity for agricultural improvement. More of their national budget is being allocated to agriculture. More foreign exchange is being made available for fertilizer imports. Some governments have scrapped their cheap food policy and are supporting higher farm prices. But an important factor in present prospects is the new high-yielding varieties of wheat and of rice.

Dwarf varieties of wheat, developed with the support of the Rockefeller Foundation in Mexico, are now being planted across South Asia and in North Africa. In West and South Asia, these improved varieties now cover an estimated 16 percent of the total wheat acreage.

Two new tropical varieties of rice (IR-8 and IR-5) have been developed by the International Rice Research Institute in the Philippines, a combined Ford-Rockefeller Foundations venture. They have been planted on about 13 million hectares or about 7

*Quentin M. West is Director, Foreign Regional Analysis Division, Economic Research Service.*

percent of the rice land in South and Southeast Asia this year (1968/69).

These new grain seeds are especially responsive to heavy application of fertilizer, as many old varieties are not. When grown under proper conditions, they produce yields which may double or more those of the old seed. A rough estimate, based on very limited information, is that the new varieties of rice will add about 9 percent to the total production of South and Southeast Asia in 1968/69, compared with what production would have been without them. Wheat production in West and South Asia in 1968/69 may be 20 percent higher due to the new dwarf varieties. This is difficult to estimate because this year and last have seen good weather following 2 years of drought in several countries. Also, fertilizer consumption has been rising sharply and grain acreage has gone up.

Several factors will impede expansion of the new varieties. They are new to the regions where they are being introduced and may become susceptible to local diseases and insects. Plant protection services are primitive in most of these countries. Without large investments in irrigation facilities, the potential of these new seeds will not be realized. Since the new rice matures early, during the latter part of the wet season, drying facilities must be supplied.

Also, priorities given to agriculture could weaken as the food crisis of the past few years abates. Farm prices could fall and reduce farmers' incentives. If internal marketing and distribution facilities are not improved, increased food supplies may not reach the people who need them. Also, as countries begin to produce a surplus over their effective domestic demand, problems of finding export markets at satisfactory prices soon develop.

From our own history, however, we know that the path of agricultural development is not always smooth. It would be too much to expect unruffled progress in the developing countries. The important thing is that agricultural development has gotten off dead-

center and is moving. With hope, we can expect the progress to be greater than the problems.

### World Food Situation

What is the size and scope and history of today's world food problem? Where is it centered? And what are we of the United States doing to help to solve it?

Opinions on the magnitude of the world food problem have often swung between extremes of pessimism and optimism. In the late 1940's, considerable concern existed about world food shortages. Fears lessened as surpluses accumulated in the early 1950's. However, by the mid-1950's, supply management and food aid programs began to reduce the large U.S. reserves. Then in 1966, there was a rapid draw-down of world grain stocks and an increase in grain prices largely as a result of expanded imports by India and the Soviet Union. India had 2 successive years of drought, and the Soviet Union had two crop failures in 3 years.

These events were taken by many as evidence that the world food problem was worsening, and again raised the question whether there would be sufficient food in the future to supply the rapidly growing world population at acceptable levels of nutrition.

In 1967, the situation was somewhat different. Record grain crops had been produced in the Soviet Union, Canada, and Australia (1966/67). India harvested almost 100 million tons of food grain (1967/68), compared with 73 and 78 million in the previous 2 years. Western Europe and South Africa also had record grain crops. Crop production gains in 1967 were especially marked in the less-developed countries of the free world. Per capita food output increased by about 5 to 6 percent, a recovery to the previous record level of 1964 or slightly above.

Record crops in the developing countries in 1967 and the successes of the new high-yielding varieties of wheat and rice have led many to be

more optimistic about development possibilities in these countries. They feel that the new grain varieties, plus a whole new agricultural technology involving large fertilizer applications, irrigation, and double (or even triple) cropping can revolutionize agriculture and food production in many of the developing nations.

Food production again increased in the developing countries in 1968 but only at the same pace as population. Per capita production remained at practically the same level as in 1967.

It is hard to determine with any degree of accuracy the current food situation in the developing countries and project how it will change in the future. Statistics do not exist, or at the best are rough estimates, in many nations for even the most basic elements of population, production, and trade. Weather may cause fluctuations in agricultural production as great as 25 percent and obscure other changes. The U.S. Department of Agriculture is doing research on the world food problem because it is essential to our programs for food aid, agricultural trade, and domestic production to have the best estimates possible of developments in these countries. The major reports on this research are *The World Food Budget, 1970*, (FAER 19), and *World Food Situation; Prospects for World Grain Production, Consumption, and Trade* (FAER 35). Some highlights of these studies follow.

### The Food Gap

Probably two-thirds of the world's people live in countries with nutritionally inadequate national average diets. The diet-deficit areas include all of Asia except Japan and Israel, all but the southern tip of Africa, and most of South and of Central America. The calorie level of the diets of people in these less-developed countries averages about three-fourths that of people living in developed countries, and is 150 to 200 calories below the minimum standard of 2,400 calories required for normal activity and health.

Consumption of about 40 pounds additional grain per person annually would be required to meet this caloric deficit. The total additional grain required for the free world developing countries would amount to about 25 million metric tons of grain, or about 10 percent of their present production of grains. Almost two-thirds of this requirement is in four major food-aid countries—India, Pakistan, Indonesia, and Egypt, with over 45 percent in India alone.

There is also a deficiency of protein in most of the developing countries. Daily consumption of protein by the people in these countries averaged less than two-thirds of the level in the developed nations.

Food production has been increasing at a slightly faster rate in the developing countries than in the developed countries, but the per capita trend in developing countries has been slowed by a high rate of population growth. Annual population growth has reached  $2\frac{1}{2}$  to 3 percent in many developing countries, as widespread application of medical technology and improved food supplies have reduced death rates.

An important aspect of the world food problem is to bring birth rates into balance, and some progress is being made in this effort. The most encouraging signs come from Chile, Hong Kong, Singapore, Taiwan, and Trinidad, where birth rates have fallen so fast that the number of babies born in 1966 was less than in 1960. Fairly clear signs of a decline in the crude birth rate are now reported from Ceylon, West Malaysia, Jamaica, and Costa Rica.

Over the past two decades, food production per capita has increased in the developing countries at an annual rate of only about one-third of 1 percent, whereas food consumption has been increasing at almost one-half of 1 percent per capita.

The gap between production and consumption has been made up by increased food imports from the developed countries. Food imports by

the developing countries have been mostly grain to increase calorie intake.

Before World War II, the free world developing countries (excluding the grain exporters—Argentina, Mexico, Burma, Thailand, Cambodia) were net importers of only 2.3 million tons of grain. But for the past few years they have imported nearly 30 million tons annually. More than one-fourth of this has gone to India.

What have been the forces responsible for this gap between production and consumption in emerging nations?

*Higher Levels of Living*—Before World War II, there was little concern about the welfare of people in the developing countries. The great mass of people in these areas subsisted as they had for centuries, at the hunger margin; this was more or less a fact of life.

Since then, 66 of these developing countries have become independent. Almost without exception, they have immediately embarked on a program of economic development. These have had varied success, but in general they have brought about some improvement in the per capita income; 1 to 2 percent annually. With rising incomes, people demand more food. They also

desire higher quality food which requires greater agricultural resources for their production.

As incomes rise, if increased supplies are not available, food prices go up, and the poorer people—whose ability to buy has not improved—can obtain even less food. Because of the great importance of food prices to a large majority of the population, sharp rises in prices are likely to have political repercussions. Under such circumstances there are strong pressures to expand food imports. With food aid available, this expansion has been possible without diverting scarce foreign exchange resources.

*Urbanization*—The impact of population on food supplies in the developing countries is accentuated by the concentration of people in cities. The extremely rapid growth of urban population compounds the problem because it imposes the difficult task of improving the distribution system so food can be moved from producing areas to urban areas.

To accomplish this task, incentives must be used to bring farmers into the commercial economy. Not only must there be an increase in production of

Seed testing laboratory in India, left. Right, Bolivian woman compares small native potato with improved variety now grown with help of Alliance for Progress program.



food, but marketing facilities must be built to transport, store, process, and distribute the farm products. When this task is not accomplished, urban centers have to rely on imports for much of their food supplies.

*Availability of Food Aid*—The United States has long shown a great concern for the hungry people of the world. Immediately after World War II, agricultural aid programs were instituted to supply food to war-torn areas of Europe. In the early 1950's, following a severe drought in India and Pakistan, special wheat loans were made to these countries.

During the 1950's, American farm output increased much faster than did consumption, and surpluses of several agricultural products began to build up. In an effort to dispose of these surpluses and at the same time give foreign countries an opportunity to obtain agricultural products which their limited foreign exchange would not permit them to buy, Congress in 1954 enacted Public Law 480: "To increase the consumption of U.S. agricultural commodities in foreign countries." Since that time, the United States has shipped over 135 million metric tons

of wheat and about 40 million tons of other grains under this program.

This U.S. food production capacity and the large accumulation of U.S. grain stocks has made it possible for the developing countries to expand their consumption faster than their production over the past decade.

### Should We Feed the World?

The policy of the United States is to encourage and assist the developing nations of the free world to develop economically and improve their own food production so they will become less dependent on food aid. A significant feature of the Food for Freedom program is the requirement of self-help efforts to accelerate food production within the food-deficit countries themselves.

Food aid probably will continue to be needed for the next decade. But dependence on food aid should diminish as these countries accelerate agricultural development and economic growth to the point where they can produce or commercially import their food requirements.

If the developing countries raise

India extension guide estimates size of corn raised by farmer at right, who achieved highest yield in his area.



their rate of increase in agricultural production to 4 percent annually—a rate already reached by a few countries—they would be achieving a high enough rate of growth in food production to provide minimum adequate calorie levels for their people by 1980 and break their dependence on food aid. However, this would require unprecedented increases in resource commitment to agricultural development. It would require massive efforts by developing nations and considerable assistance by developed countries.

National leaders have emphasized that “hunger is a world problem. It must be dealt with by the world.” They have called for a “truly international effort to combat hunger and to modernize agriculture.” The Food for Freedom Act affirms the “sense of Congress that the President should encourage other advanced nations to

make increased contributions for the purpose of combating world hunger and malnutrition, particularly through the expansion of international food and agricultural assistance programs.” The Food Aid Convention under the International Grains Arrangement of 1967 is a step in this direction.

Although faster progress is needed among developing countries, there is no immediate likelihood of a world food shortage. It is estimated that the production capacity in the developed nations will be more than ample to meet import needs of the developing nations in the foreseeable future. In fact, even if there were no improvement in the rate of agricultural development in developing countries and their grain import requirements doubled over the next decade, the developed countries would still possess some excess grain production capacity.

South Vietnam boy with American Sugar Baby watermelon grown in his country under the U.S. aid program.

