

From our reporter at the Crop Productivity Conference, Harbor Springs, Mich.

## Scientists "holding up progress"

Even five years ago an all-out assault on global hunger and poverty could not have been successful, Rockefeller Foundation vice-president Sterling Wortman says. Only now, "for the first time in history," have the scientific advances in agriculture and knowledge of the development process made it possible to deal with these dual problems together, effectively. However, now "it is the scientists holding up progress; they are the most conservative element in the world."

In his keynote address to the conference, Wortman listed some of the advances he believes make a "frontal assault" on hunger possible, and emphasized that they include the overturning of some long-held prejudices. Conventional wisdom of a decade ago held that uneducated farmers would be too conservative to change their cultivation practices. Now it appears that such farmers were often not really able to take advantage of the innovations offered, and planners are finding that the weaknesses lay in their own programs. Thus, when they compared the yields per acre from mechanized farming to those from manual farming, they found that the "intensive gardening" prevalent in many developing countries was more productive.

But innovation is still necessary and must proceed at a "forced pace," Wortman said. To introduce new crop strains and farm technology appropriate to a given region, scientists must become more directly involved at the operational level. Local scientists in some countries are particularly reticent to do this or to accept innovations they haven't created themselves. Therefore, from the beginning more scientists must be encouraged to get involved in the process of planning for change.

## Advances in rice

Rice is the staple food for almost half the world's people, including nearly nine-tenths of the very poorest, whose annual incomes are less than \$300 a year. Their needs are being met only because of newly developed strains, whose extra yields are now valued at about \$3 billion per year. Nyle Brady, director of the International Rice Research Institute (IRRI) in the Philippines, told the conference of more developments to come.

Early IRRI research concentrated on developing short, stiff stalks of rice that would not fall over before harvest period. But 30 to 40 percent of the rice-growing areas in Asia get water standing over half a meter deep at times, which would kill the short varieties. Thus recent efforts have concentrated on developing rice strains that will grow as much as needed to rise above the water level. As a result, one new breed can grow 31 centimeters in 24 hours, if necessary.

One recent discovery with potentially important applications is the presence of natural nitrogen fixation in the root systems of some rice plants. The amount of atmospheric nitrogen thus rendered into useful form equals about 30 kilograms per hectare each season. Brady calls this amount "significant," but in an interview with *SCIENCE NEWS*, he cautioned that little is known about the mechanism involved and that adding artificial fertilizer may interfere with the natural process (a common occurrence with other plants).

The IRRI is also trying to increase the protein content of rice, but Brady warns against expecting a single, spectacular breakthrough. Unlike corn, in which effective protein content was increased dramatically by changing the level of one amino acid, rice contains a good balance of these protein constituents. Brady says that an eventual 25 percent protein increase may be achieved, but the overall yield per hectare may suffer.

## More may not be better

Harvard nutritionist Jean Mayer warned conferees not to concentrate on increasing productivity alone: "You may wind up with a food supply which is very different from the one we used to have and which is less adequate." A broad view must be taken before specific innovations are implemented, or unfortunate nutritional, environmental and social consequences may occur.

Already, in the United States, adverse effects of changing diet may be seen. Some 50 percent of Americans have no teeth left by the age of 55, he said, due in part to the 125 pounds of sugar each consumes in a year. Colon cancer is now the second most frequent type for both sexes, partly because of decreasing fiber in diets. Even middle-class children are beginning to suffer from mineral deficiencies once so rare they were seldom even considered, such as a lack of zinc.

Too little attention is paid to food supplies after they leave the farm, he said. In many developed countries, including the United States, 40 percent of the food winds up in the garbage. In developing countries, 25 to 40 percent spoils before it reaches the table. Yet only a tiny fraction of research budgets address these and related problems.

There is also insufficient scientific attention paid to increasing the productivity of foods other than a few major crops. "Economists do not feel comfortable with anything that can't be counted or that doesn't travel in international trade routes," Mayer charged. Yet the adequacy of a society's diet may depend on home-grown food sources, such as rabbits, goats, eggs, fruits and so forth.

Malnutrition may increase even as a country's crop productivity rises, he concluded. Awareness of this possibility by scientists and increased international cooperation among nations would both be necessary to solve the world's food problems.

## Briefs from background papers

- Only 7.6 percent of the earth's land surface is cultivated; most of the rest is too cold, hot, dry, sultry, rocky or steep. The total area of potentially arable land is more than twice that which is actually cultivated. Half of the potentially arable land lies in the tropics. Availability of water is more likely to prove a limiting factor in increasing agricultural production near areas of large population than availability of soil.

- Much of the work done by photosynthesis in joining carbon atoms into carbohydrates is undone again during respiration by the plant itself, at least for the common "three-carbon" plants of the temperate zones. Two kinds of respiration occur. So-called "dark respiration," which does not need the presence of sunlight, can waste 30 to 70 percent of the net carbon assimilated. Recent research indicates this reaction may occur outside mitochondria, the usual leaf reaction sites. Photorespiration dominates during daylight at higher temperatures. If some way can be found to interfere with this process, net carbohydrate production may be increased by 50 percent, the experts predict.

- Insect resistance to pesticides is increasing, but of 200 known cases of resistance, only a few species have been subjected to advanced biochemical and genetic studies; the housefly, three mosquitoes, a cockroach, the bedbug and a few others. To help reduce the carry over of pests from one season to another in the field, a portable stubble-burning machine is being designed and tested.