Editorial

Appropriate Education for Plant Pathologists Planning to Work in Developing Countries

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During recent decades, the value of the education that U.S. universities give graduate students from developing countries has been steadily declining in its relevance to the problems these students will face when they return to their homes. It is not surprising that much of their education is inappropriate, since that educating is taking place in a society where only 2–3% of the population is living on farms. In contrast, these professionals are returning to societies where 30, 40, or even 80% of peasant populations are engaged in farming. Furthermore, most developing countries are in tropical ecosystems and have extremely diverse agricultural systems.

Most students from developing countries are being trained in modern agricultural systems (i.e., high input, commercial, mechanized) as opposed to the traditional subsistence or partially subsistence systems of agriculture in their home countries. Students from developing countries—and U.S. students interested in working in international agriculture—soon discover that "basic research" (e.g., biotechnology) is prestigious and intellectually appealing and easily attracts funding. The best of them seek training in basic research, forsaking applied research. We need to encourage students—foreign and domestic—to concentrate on principles and methods that will help solve the applied problems of managing agricultural production.

The present overemphasis on biotechnology in plant pathology is a serious concern relative to the education of students from developing countries. The emphasis of many graduate courses in plant pathology is being drastically changed from agricultural systems and the whole plant to the cell and its contents. The problem is not so much what new information is being taught, but rather what traditional information is being left out. What is the usefulness of education that primarily emphasizes biotechnology for students who will return to countries with little infrastructure, few plant pathologists, laboratories with little or no sophisticated equipment, and peasant agricultural systems? A major difference between previous technologies, such as the "green revolution," and biotechnology is the "private" character of most applied agricultural biotechnology research. Although there will obviously be benefits to developing countries from the new technology, at the same time, private dominance of research and development in biotechnology will create such difficulties as access to materials and information, conflicts on research priorities, lack of funding for research immediately applicable to developing countries, and impossible costs to a developing nation for the hardware and products of the new biotechnology. I am not suggesting that students from developing countries should receive no education in biotechnology and the molecular aspects of plant pathology. Students who do manage to come to the United States for graduate training are usually a highly select group and will be among the future scientific leaders of their nations. They will need to know enough about biotechnology to make sound judgments on what is relevant and practical for their country's agriculture.

Most of the students from developing countries who come to the United States to study come from tropical countries. Yet, few courses are available at U.S. universities on tropical agriculture and/or tropical plant pathology, and in any case, only a superficial introduction can be given in one course to these subjects. Students from tropical developing countries educated at U.S. universities in temperate zone plant pathology frequently have a difficult time in readjusting to work in their home countries. Some make serious errors in planning and implementing their strategies for controlling plant diseases in the tropics, especially diseases that occur on the food crops of small farmers. It is not enough to be competent in plant pathology. It is also important to gain an understanding of fragile tropical ecosystems and their transformation into agroecosystems and of the socioeconomic factors that influence food production and plant disease control.

Students from developing countries should be encouraged to consider the feasibility of working with small farmers. Perhaps half or more of the world's arable land is farmed by small subsistence farmers. Poverty, the lot of a majority of the rural populations, is especially severe for small subsistence farmers. Agricultural scientists know how to help educated farmers engaged in commercial agriculture but have had less success in improving the welfare of these small farmers. It has become increasingly clear in recent decades that much of the agricultural technology that has been so successful in temperate developed areas has only a limited application in the tropics. Although millions of small farmers are benefiting from the green revolution in agriculture that brought about the remarkable increases in the yields of wheat and rice in Asia, one of the most disappointing aspects of the green revolution has been that it has not yet been helpful to many small farmers, especially those of the tropics of Latin America and Africa.

Small, traditional farmers are not always interested in the highest yields but, rather, are usually more concerned with attaining stable, reliable yields. They minimize risks and seldom take chances that may lead to hunger, starvation, or losing their land. Nevertheless, many of the decisions made by small farmers are rational and innovative. Small farmers will adopt agricultural innovations that are sound and without undue risk. However, most agricultural projects are still primarily concerned with increasing production, and this is often inappropriate if their goal is to meet the needs of the intended beneficiaries. Adoption of unmodified technologies from temperate regions often leads to failure. North American temperate agricultural systems are relatively simple monocultural cropping systems and make better subjects for reductionist studies than do complex traditional systems. Thus, the latter are often not considered appropriate subjects for "scientific" inquiry.

Finally, many graduating plant pathologists from developing countries and the United States heading for tropical assignments still have not received adequate training to work with small farmers or tropical farming systems. They may be well prepared regarding temperate plant pathology, but they seldom have a sound understanding of how to work most effectively in a tropical environment. Therefore, it is extremely important that they receive special education and training in preparation for a career in the tropics. When possible and appropriate, thesis research (especially at the Ph.D. level) should be done in a tropical environment. Unless we improve the training of plant pathologists to work in developing countries, we will be producing scientists who may be good plant pathologists but who are not culturally sensitized and are otherwise ill prepared for solving the problems of stable food production in the tropics.