Tackling World Hunger and Malnutrition through Horticultural Research, Graduate Education, Extension, and Management in Cooperation with U.S. Universities

PRESIDENTIAL ADDRESS

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ASHS President, 1984–85

Horticulturists can contribute significantly, in association with other professions, to the alleviation of the most poignant human stresses of our age, namely, poverty, hunger, malnutrition, and the social unrest and diseases which they engender in the least developed countries (LDCs). These stresses are accentuated by escalating populations which need to be addressed by others. The problems haunt our souls and challenge our intellect for solutions. Millions afflicted by famine cry out desperately and repeatedly for aid on our television screens; nowhere was this more evident than in Africa in 1985. Millions more, in silence and in oblivion, live anguished lives of abject poverty and misery.

I will focus mainly on the small grower and consumer poor and not on plantation horticulture, which is often well developed in many LDCs. I have a personal interest and some experience in this area because of involvement in a Title XII Bean/Cowpea Collaborative Research Support Program (CRSP) project in Latin America. Some general considerations and background on the history of the problem, current needs, reciprocal benefits of aid programs to the United States and host country, research management, and the value of some language training for U.S. cooperators will be presented. Some specific strategies, challenges, and recommendations will be made in the areas of research, graduate student education and training, and extension will be mentioned. Most of us have an interest and are involved in this process to some degree since we supervise the training of graduate students from overseas. Also some 21% of ASHS Members come from 81 different countries and about 25% have some interest in tropical horticulture. It is deep involvement!

Some History

Questions are often asked about the historical basis for the plight and lack of development of the Third World. Latin America and much of Africa and Asia were crushed by the European colonial powers whose purpose was to exploit certain natural resources for the welfare of the home country rather than nurturing the development of the newly acquired territories. Of course, improvements in all kinds of infrastructure did occur in these territories, but, in general, the masses remained in poverty and their standard of living, health, and nutrition even deteriorated in some countries. The former European powers and often a wealthy elite with native government support — fostered the development in the LDCs of plantation crops by a) breeding, b) adopting improved agronomic crops, c) reducing postharvest losses, d) improving marketing, e) establishing vegetable seed industries, and

ment was made to improve subsistence crops. For example, the cooking banana or platano, which is eaten by more than 200 million people and grown largely on small holdings, has received very little attention. Improvement of grain legumes and vegetables have been neglected in the LDCs until recent decades. The consumption of vegetables and fruits in the tropical LDCs is about half that of the developed countries. There is a serious need to promote the increased production and use of vegetables in the tropics to provide calories and protein or supplement calorie-protein requirements provided by present staple agronomic crops. The contributions of vegetables to supplying vitamin and mineral requirements of the diet has largely been emphasized in the past. However, the superiority of a number of vegetable crops in producing more kcal/ha/day (potatoes, carrot, sweet potato) and kg protein/ha/day (cabbage) in comparison with major agronomic crops has been documented recently by H.M. Munger (personal communication). In addition, Munger showed that many vegetables have a higher protein content than rice and legume seeds when expressed on a dry-weight basis. The minerals calcium and iron and Vitamins A and C are often deficient in diets; these can be corrected by use of selected vegetables, particularly native leafy vegetables. There are numerous plants with high protein content in the tropics that can be used as leafy vegetables, but little has been done to improve their productivity or indeed the horticultural crops in general, except a few fruit crops for export and some selected vegetables in a few countries. Even where new improved varieties have been developed, a limitation to their adoption is the absence of a vegetable seed industry to produce seed and sell to producers. There is a challenge to horticulturists and to all groups concerned with upgrading life in LDCs to gain political support to improve horticultural crops by a) breeding, b) adopting improved cultural practices, c) reducing postharvest losses, d) improving marketing, e) establishing vegetable seed industries, and

HortScience, Vol. 20(5), October 1985
Dermot P. Coyne was born in Dublin, Ireland, on 4 July 1929. He completed one-year courses in general horticulture at Johnstown Agricultural College, Wexford (1947-48) and the National Botanic Gardens, Dublin (1948-49), Ireland. He received a certificate in Botanical Gardening from the latter institution and a Senior Certificate in Horticulture from the Royal Horticultural Society, England. In 1949 he secured a scholarship to attend University College, Dublin, and was awarded a BS in horticulture in 1953 (first class honors), an MS in horticulture in 1954, and a DSc in 1958.

He obtained a research assistantship (1954) with Dr. H.M. Munger in the Deps. of Plant Breeding and Vegetable Crops, Cornell Univ., Ithaca, N.Y., and was awarded a PhD (1958). While at Cornell he married Ann Gaffey, a native of Medford, Mass. After graduation he joined the International Division of the Campbell Soup Co. and was stationed at Kings Lynn, Norfolk, England, as assistant manager of agricultural research. In late 1960, the Coynes returned to the United States at the invitation of their friend, the late Dr. Jerry A. Warren, and with the support of Dr. J.O. Young. Dermot accepted a position in the Dept. of Horticulture and Forestry, Univ. of Nebraska, Lincoln. He has held the following positions in the department: Assistant Professor (1961-65), Associate Professor (1965-68), Professor (1968 to present), and Acting Chairman (1974-1975).

Dermot Coyne's special field is vegetable breeding and genetics. He has conducted research and published on resistance to bacterial (with M.L. Schuster) and fungal pathogens (with J.R. Steadman), seed quality, flowering, plant architecture, yield, and adaptation of dry beans. He developed 5 high yielding bacterial disease resistant Great Northern cultivars which have occupied 60% of the commercial acreage in Nebraska for several years. He is currently Principal Investigator of the Title XII Bean/Cowpea CRSP project on breeding and genetics of beans for disease resistance in the Dominican Republic. He also has been involved in breeding and genetic studies of powdery mildew resistance, stability of fruit shape, fruit quality, line and F2 development in Butternut squash and also high quality in small fruited Hubbard and Marrow squash. His high quality Butternut Ponca cultivar is widely grown. He also teaches a graduate course in plant breeding and directs graduate student programs for MS and PhD degrees. During his career, he greatly appreciated the good counsel of a long time department member, Dr. H.O. Werner (92 years old this year).

Dermot Coyne has been very active in ASHS activities, having served on 10 committees (chairman of 4), served as an Associate Editor (1974-78), Editorial Board of Horticultural Reviews (1980-81) and Plant Breeding Reviews (1982-83), Research Division Vice President-elect (1978-79) and Vice President (1979-80), and Symposia and Workshops Committee Chairman (1980-81), and President-elect (1983-84) and President (1984-85) of the Society.

He has also been active in other associations. He served as President-elect (1982-83) and President (1983-84) of the Nebraska Chapter of Sigma XI and President of the Nebraska Genetics Institute (1966-67). He also served as chairman of the International Bean Improvement Cooperative (1968-77), chairman of the Technical Bean Advisory Committee to CIAT, Colombia, South America (1975-79), and a member of the International Technical Committee Title XII Bean/Cowpea CRSP (1981-85).

Dermot Coyne has received the following ASHS awards: National Canners Association (1967), Fellow (1974), Aggrow (1974), Campbell (1975), and Marion W. Meadows (1976 and 1980). He was also awarded the Bean Improvement Cooperative Meritorious Research Award (1975), the University of Nebraska Chapter Gamma Sigma Delta Research Award (1980), and Fellow of the American Association for the Advancement of Science (1983); he was recognized as advisor for the Univ. of Nebraska. Sigma XI graduate student award (1983).

The Coynes are the parents of 6 children, PJ, 27; Brian, 26; Thomas, 25; James, 22; Catherine, 20; and Gerard, 18.

f) training specialists to work in these areas.

Since World War II there has been a significant commitment of resources from donor Western governments, particularly the U.S. Agency for International Development (AID), private foundations, the Food and Agriculture Organization (FAO), and the World Bank to support research on selected staple food crops. Thirteen International Research Centers have been established. The achievement in boosting the yields of rice by the International Rice Research Institute (IRRI) and wheat by the International Maize and Wheat Center (CIMMYT) based on high energy inputs have received worldwide acclaim and have made many countries sufficient in these commodities. The return on this monetary investment has been of gigantic proportions! However, the “Green Revolution” had little effect on most poor growers in the Third World since most of them grow crops on marginal lands of low fertility, under nonirrigated conditions, with limited resources, and under associated cropping systems. Little attention has been given to horticultural crops, except for 6 vegetable crops at AVRDC (Taiwan), dry beans and cassava at CIAT (Colombia), cowpeas at IITA (Nigeria), pigeon peas and chickpeas at ICRIISAT (India), and potatoes at CIP (Peru).

The relatively new (1981 to present) Title XII Bean/Cowpea CRSP project between 9 U.S. universities and 13 LDC host countries, funded by U.S. AID, is now making progress in reducing and overcoming the problems of these crops as well as improving nutritional and cooking seed qualities. This type of cooperative project could serve as a useful organizational model in developing additional projects to improve other vegetable and fruit crops of value to LDC small growers. This may be difficult to achieve politically because those involved in the decisionmaking process for resources for the future have little understanding about even the value and importance of horticultural crops in the United States not alone in the LDCs. We need to communicate more effectively with the opinion and decisionmakers in the United States for the benefit of horticulture at home and overseas.

**Needs**

Increased food production will not alleviate the hunger problem for many since the problem is largely a matter of inadequate food distribution, poor storage, and the lack of buying power on the part of the hungry poor. Poverty lies at the root of the problem! Horticulturists need to understand the complex social, economic, and political interconnections at the national and international levels that serve to maintain poverty or at least do little to alleviate it to a significant degree.

We can act in association with others in different disciplines, and with those in power, where permitted to do so, as quiet positive interveners for social change, through promoting improved research, education, and extension. This should lead to more productive subsistence crops and better storage, distribution, and use of those products through carefully targeted assistance programs that benefit the poor. It is heartening to think that the processes of education and economic development may gradually produce a more enlightened, indigenous agricultural and political leadership and a civil service dedicated to broad-based country improvement. The key to successful economic change overseas lies in education of the masses, adoption of social security, population control, changes in political motivations and goals, research, education, extension programs, incentives to increase production, and wise use of natural resources. Our U.S. foreign aid and university administrators would do well where they can to propagate the merits of the land-grant system and education for all. The United States rose from an underdeveloped to the most developed country on Earth through this process! The European system of separate higher education, research, and extension systems in agriculture, which have been adopted in many LDCs, are not satisfactory organizational models to deal with the current needs for broad-based agricultural improvements.

**Criticism of Aid Programs in the United States**

There has been considerable criticism by some commodity groups in the United States concerning involvement of our land-grant institutions and agencies of the U.S. government in cooperative research on crops in underdeveloped countries. They argue that we should not help the competition because increases in food production in those countries will lead to a loss or decline in agricultural exports. Some vested interests in the developed world and in the underdeveloped countries themselves may not want to change the status quo since they see the LDCs as a source of cheap labor, cheap resources, and profits. Some argue that they should be left alone “to pull themselves up by their own bootstraps”, not realizing that many governments resist significant political and social change among the peasant farmers and urban communities.
poor. Because of the misconceptions of the value of U.S. aid both in the United States and in the Third World and the global consequences of hunger, the U.S. Congress directed AID in 1984 to undertake a development and education program to help the American public become more aware of the impact.

**Reciprocal Benefits**

1. It is in our best interests to secure peace in the world. A practical means to achieve this goal in part is to reduce poverty through improved food production and distribution, increased employment, and improved health and education in the LDCs. The cost of all U.S. AID programs amounts to 0.5% of our total federal budget, which is a reasonable cost considering the benefits. In 1983–1984, the United States contributed about $45.75 million to the support of the 13 international centers. It is a small investment in relation to our country's overall foreign-aid program. It would be wise to increase that investment because the expected gains both for them as well as for us in the United States.

2. As the prosperity of a people improves, they are more able to invest in their own development, increase imports from us, and reduce their debt to us. Improvement in foreign trade is vital to our economy. It already accounts for about 25% of our Gross National Product (G.E. Schuh, unpublished manuscript).

3. It provides an opportunity for us as individuals to be more effective researchers and teachers in certain areas for the benefit of both the United States and host country.

4. The United States has gained immensely from the introduction of new horticultural crops and new sources of germplasm from overseas for horticultural crop improvement.

5. It provides an opportunity to learn foreign languages so we can communicate more effectively with people in other countries. Improved communication is good for humanity, science, and business!

**Management**

It is necessary to strive to have a United States–host country crop-research aid program institutionalized during the early years of its development. Political support for the program should be developed so that when of its development. Political support for the program institutionalized during the early years during the assistance phase so that there are trained people to fill the specialized positions to conduct the program when the program is terminated. A reasonable degree of tenure of members of a host country’s administrators and scientists is necessary to ensure the success of a project since they are often of a long-term nature. Some top administrators may have little background in agriculture and are political appointees based on party affiliation. Low salaries, poor facilities, little incentive to publish, limited opportunity to travel to professional meetings, and lack of institutional appreciation and support for talented horticulturists often result in low morale and cause employees to leave public research service or to hold one or more additional jobs which must necessarily siphon off energy from their project assignments.

It is difficult for many young scientists overseas to work in remote small experiment stations. They prefer to have a more culturally enriched life in or near a major town or city. Yet the problems of food production must be resolved in the countryside. Some may indeed travel by car at infrequent occasions to visit plots at a distant subexperiment station and try to return home that evening. They may not have per-diem expenses to stay overnight in a local town. They may be reluctant, in some cases, to travel alongside campesinos on the crowded, noisy, colorful buses because it is not befitting their status. In addition, because of travel constraints, ease of management, and tradition, much of the research is conducted on the experiment stations. Few demonstration tests or pilot projects are conducted on farmers’ fields to test or show the value of some new cultural change. Also, poor farmers may be reluctant to accept information from people who have had very little direct contact with their type of farming and life-style, who don’t understand their problems, and who appear disrespectful of them.

W.F. Whyte (Cornell Univ.) notes that extension personnel from the dominant culture in Latin America may not know the language of the native Indians. Some Indians may have a poor knowledge of Spanish and, as a consequence, the dominant culture often disrespects the native culture, leading to further communication barriers. Whenever I hear or see disrespect or lack of concern for the ideas of poor farmers or the poor in general, I am reminded of the eloquent lines, about respect for the poor, written by Thomas Gray (1750) in his poem Elegy Written in a Country Church Yard:

Let not Ambition mock their useful toil
Their homely joys, and destiny obscure;
Nor grandeur hear with disdainful smile,
The short and simple annals of the poor.

I think it is important to try harder to demonstrate to many students from overseas the value of performing field operations to a reasonable degree and for all of us from the United States and the host country to respect the poor farmers, because they also have useful ideas to contribute to a research proposal. This I know is difficult to do because of peer pressure in the culture!

I remember during an overseas assignment (not an LDC) as a young man I used to harvest my vegetable plots in the company of a group of strong peasant women who formed my “crew”. A rural banker, who was a friend, expressed a typical local attitude in saying to me: “If you have a PhD degree from the United States, why do you work in the fields, tan your skin, and work with women?” Others don’t do that.” I dealt with his inquiry by means of a question. “Could you do a good job if you never worked in your bank, never supervised your staff or operations, and never visited with or evaluated your customers personally?” He said “no”.

“Well then,” I said, “With all due respect, my vegetable research plots also need my personal attention just like your bank.”

Those who have grown up in dominant cultures in the developed nations often fail to understand the psychology of oppressed people in the LDCs who have culturally transmitted fears, mistrust, and often dislike for the policies of donor western nations even though they are well-intentioned. Social scientists are well aware of this problem! It is necessary for the cooperating parties to try to develop a complete openness and respect for each other to improve communication and the project’s effectiveness. That brings me to the next topic, namely, language.

**Language Capability**

A lack of language capability can impose a tremendous hindrance to good communication, good understanding, and good management of an overseas project. Some think you can work effectively in a foreign country if you have a good, sincere attitude, or a good translator, or if your principal cooperator knows English. Some people act as if they were oblivious to this limitation or simply don’t want to spend the time in language training. The inability to communicate in the native language is a severe limitation to understanding the production system of poor growers, the utilization system of poor consumers, the people and their culture (also appreciation), and how decisions are made, and implemented or why sometimes they are not implemented. You may only obtain a fragmentary knowledge in the above areas if you are dependent on one person or a few people for information, partly because they may fail to explain in detail all aspects of the system or, indeed, some may possess only partial information. You may miss some key elements in understanding how the crop and farming system works.

**Research and Graduate Training**

Many young scientists overseas work in poorly equipped and professionally understaffed, small experiment stations. We need to encourage and to train people to do good, useful research with limited resources and to improvise. If equipment is lacking, however, useful fundamental and applied research can still be done on cropping systems in an impoverished country with simple tools, such as a weighing scale or a meter stick, combined with simple numerical measurements and ratings, provided good questions are asked and appropriate statistical designs are used. This is also a fertile area for statistician to develop experimental designs to facilitate research on associated cropping systems. We need to inculcate in students a greater appreciation of the value of the variety or germplasm trials and that a wealth of applied and fundamental information can be collected by observant people from these tests. They also provide a good training...
ground for students to improve their sense of observation. There is currently a tremendous interest in biotechnology in our departments. All of us are excited about its potential, particularly for the improvement of protein quality in some crops, a contribution which should be of direct benefit to LDCs. Of course, we must conduct research in this area and also develop new tools to serve our needs. The intellectual challenge, however, is just as great to work with whole-plant responses and the nature of intergenotypic competition, productivity, and stability of complex associated crops in the tropics as it is to work at the cellular and subcellular levels in the laboratory. Yet, it would seem to some that you are not on the exciting, cutting edge of science unless you are involved with biotechnology. I would like to challenge you also to express to your U.S. and overseas graduate students the continuing scientific challenge and the excitement of studying whole-plant responses and associated cropping systems. Generally, people trained in the developed world have not been too adept in the past in designing an integrated strategy to alter favorably a subsistence crop-production system in a Third World country. This failure results because few of us think in terms of associated cropping or know much about the sociological, economic, and political systems in which desired and compatible changes must be made. The phrase — "If you don’t know where you are, how do you know where you are going?" — has been applied to economics. It is appropriate here also! It behooves us to know where we are in all facets of associated cropping so that we can make constructive changes.

Associated cropping has particular significance for an overseas graduate student since many of the subsistence crops in the Third World are grown in various kinds of crop associations. Yet, many of the theses conducted by these students are concerned with a monocrop system grown under high-energy inputs. They receive little training and orientation that encourages them to investigate their associated cropping systems on their return home. If they are to work effectively in this area, they must receive a more holistic education as well as in-depth training in a specialized field. W.A. Frazier, ASHS President in 1969, commented on the value of a holistic education for all students so that they have a better philosophy about their mission and purpose.

Fundamental and applied investigations in the area of biological efficiency and resistance of plants to abiotic and biotic stresses have great significance for many farmers in LDCs who have marginal land of low fertility, inadequate rainfall, and little resources to supply energy inputs. The current genetic and breeding investigations of F.A. Bliss (Univ. of Wisconsin) in improving N₂ fixation and protein content in beans, W.H. Gabelman (Univ. of Wisconsin) in increasing efficiency of mineral utilization of crops, and myself, J.R. Steadman, Anne Vidaver, and M.L. Schuster (Univ. of Nebraska) in breeding for pathogen resistance are useful examples of this type of research.

Fundamental and applied investigations can be combined successfully. In fact, the cornerstone of the horticultural profession is the integration of fundamental and applied research along with extension to solve commodity problems. It is this perspective that separates us from the other discipline-oriented departments. Too much of our research is only published and not transferred into actual practice. The research conducted long ago by Henry Jones (USDA) on genic cytoplasmic male sterility in onions and F₁ hybrid production and by Homer C. Thompson (Cornell Univ.) on temperature effects of bolting in celery and its manipulation to overcome seed-stalk formation in the field are classic examples of brilliantly conceived and executed fundamental studies and their practical applications.

Many graduate students from overseas, although of excellent academic quality, have had little experience in growing and handling plants in the greenhouse and field, in planning and planting, and in harvesting an experiment. It is not enough to know the principles of biology to be a good horticulturist! The ability to grow plants is also important. Many of them are on fellowships requiring no assistantship duties and, unless special care is taken, many of them will not acquire much proficiency in plant growing except a limited amount on their thesis project. Some of our city-raised students may also need more "hands on" training in growing plants. Remedial courses in English have been established in many universities to correct deficiencies in this subject. It seems reasonable for a department to develop a "hands on" remedial course in plant growing, management, and tool use.

Extension: Need for Concerns of Women & Ethnic Group Interactions

Women produce about 50% of the food in the Third World and work 16 hr a day at 2 jobs — one in food production and one as "hommenaker." (Janet Poley, U.S. AID, Washington, DC). It has been said that "men have the authority but women have the responsibility for most of life’s tasks." A more equitable distribution of the work load, opportunity, and rewards for women is needed in most countries. Time spent by women on water and firewood collection is often considerable so that any extra time required to use a new crop-production system must take this into account. Researchers and extension personnel need to be aware of this! Extension services in Africa neglect women even though they do much of the farm work. Male extension people tend to communicate with other male workers, so females tend to get the information second-hand. When they do receive it, they are more effective in delivering the information to each other through "networking" (Janet Poley, U.S. AID, Washington, D.C.). It is obvious that extension services in some countries need to train and hire more women so that a better job can be accomplished.

There is an increasing need in our cooperative agreements to build in extension components in our aid efforts since research often is never transferred from the experiment station to the field because of lack of adequate extension services. Even where subsistence crops have been improved by the International Research Centers only limited transfer of information and improved products to the campesinos has occurred. It appears to be a policy in some countries in Latin America largely to ignore extension services to, and improvements of, some indigenous peoples. Yet, we in North America and the dominant Latin culture all owe so much to the native Indians since they domesticated many of the important food crops that underlie our present agricultural and national wealth. We must always remember that "we are born with a mortgage and a debt that we owe to the past" (Ralph Waldo Emerson). We have a rich legacy of plant domestication from the past. We need to express more our gratitude to those who went before us!

Conclusion

We can take pride in being Members of this prestigious horticultural society since it has contributed so much to the total horticultural industry, to science and to art, to the economy of our states and nation, to humanity at home and overseas, and to the development of attractive environments. We can continue through our work to affirm and to strengthen the lives of others where they have grown weak through hunger and malnutrition, we can build hope where people are mired in despair through poverty, and we can enhance beauty of place and of mind where starkness and austerity now prevail. It is an immense challenge: each horticulturist can meet it in various ways based on individual motivation, skills, and circumstances. When your legacy is written, may your epitaph simply say: "They gave their best in their times and their dreams were fulfilled."