Developing Scientific Manpower for Root and Tuber Crops Research and Extension

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ABSTRACT

Successful generation and diffusion of improved germplasm and production techniques on root and tuber crops depends not only on advancements made by international agricultural research centers such as the International Potato Center (CIP) and the Centro Internacional de Agricultura Tropical (CIAT) but also, and more importantly, on the abilities of national agricultural research and extension systems to conduct basic or applied research and validate and adapt technologies developed elsewhere. To perform these tasks, national programs, i.e., research, extension, and education systems, require available scientific manpower. The paper focuses on a strategy for developing scientific manpower for root and tuber crops research and extension adopted by CIP and CIAT. It requires collaboration between international agencies and national systems and hinges on five major elements: (1) existence of favorable conditions for national program development in the country, (2) assessment of the state of development of national programs using a well-conceived scheme, (3) training be directed at strengthening national programs, (4) positive interaction between international and national agencies, and (5)development of a national strategy for manpower development. The strategy is based on the contention that contributions made by international agricultural research centers through training may in the long run exceed those at research.

Introduction

The overall objective of national agricultural research and extension should be generation and diffusion of improved technology. In addition to conducting basic or applied research, generation of technology includes validating and adapting technologies developed elsewhere. In order to achieve the objective it is imperative that scientific manpower capable of performing these tasks exist within national systems. As it pertains to root and tuber crops, international agricultural research centers such as the International Potato Center (CIP) and the Centro Internacional de Agricultura Tropical (CIAT), have the responsibility for collaborating with national systems in developing needed scientific manpower.

Until recently, national policy makers and research planners have given more attention to cash and export crops at the expense of food crops. Furthermore, among food crops, root and tuber crops have received even less attention, often completely neglected. Lately, sparked by the factors listed below political

1. Implementation of research must be based on a perceived need to overcome constraints to production. A feeling of necessity to solve problems to improve production must exist. In some cases, new programs are seen as "opportunities" to develop agricultural resources and may not be a "priority" for the country.

2. There must be an economic incentive to the country and the producers to improve production. Increases in production caused by improved technology - germplasm or production techniques - must be compensated by a high probability for economic gains.

3. It must be technically possible to improve production and utilize the increased production. Also, favorable conditions for applying research results or introducing improved germplasm or production techniques must exist.

4. Conditions to develop scientific manpower for research and extension through national training efforts, advanced graduate studies, or short-term international training must exist. A commitment to facilitate manpower development through training must be evident.

These factors considered collectively lead to a political decision to accept or reject national research and extension efforts to improve production. Efforts initiated within national institutions without political support are doomed to failure.

Scheme for analyzing state of development of national programs

Before national and international agencies initiate manpower development efforts through training an analysis of the current state of development of the national program is necessary. Working together production potential and constraints are analyzed, research needs identified, and training requirements assessed. For the purpose of determining national and international contributions to a training program the following classifications may be used:

Advanced Programs: These are programs in countries where there is a clearly demonstrated potential and a national policy to increase production, and these have been accepted as a goal by research and extension institutions who have credibility within the country. Continuity for research and extension in the crop is assured.

Intermediate Programs: These are programs in countries where the potential for increased production exists and, although there is a research or extension program, a national policy to increase production does not exist. In these countries objectives for the crop are not clearly defined and researchers may be responsible for several crops. Continuity for research is uncertain.

Developing Programs: Those are programs in countries where there is a potential for increasing production but marketing and utilization alternatives have not been explored. Economic incentives are not clear. Some government agencies may have an interest in improving production. Research in the crops may be carried out by a few specialists or universities.

Potential Programs: These programs are in countries where there could be a benefit from increased production, but where there is a lack of national interest

to increase production. In isolated areas some farmers may produce the crop and a few local researchers and extensionists may be interested but they do not get support. National programs simply do not exist.

The fundamental difference between countries in these four categories, is the favorable political decision in the first category and the lack of it in the other three.

The analytical nature of this scheme serves a a basis for dialogue between national and international organizations. Through open communication, collaborative research and associated training plan based on real needs may emerge. After all, it is the needs of the country that should be addressed.

A recent CIAT study in building of human resources for agricultural research and on participation in research networks revealed less participation in research networks by cassava researchers than rice or beans researchers. The study points out that although there are fewer cassava researchers than rice or beans researchers linkages among cassava researchers are more frequent. To a certain extent this situation was felt to be a consequence of less developed infrastructure for production and marketing in cassava. A contributing factor, of course, is that cassava is a relative newcomer to research interests, as reflected by the "local" scope of researchers' linkages.

Training directed at strengthening national programs

Improvements in production in the developing world will depend on what national researchers, extensionists, and educators do in their respective countries. As such CIP and CIAT's training programs are directed at national programs with the overall goal of improving national abilities to:

- identify research needs and priorities,
- identify and use existent technology relevant to the country's needs,
- conduct research in the most important problem areas,
- evaluate research results from other sources under home country production conditions,
- participate in the transfer of appropriate technology within their countries and surrounding countries, and
- train others to identify existent technology and research needs, conduct research, evaluate results, and participate in the transfer process.

To achieve these objectives CIP and CIAT have developed somewhat different types and categories of training activities, ranging from production courses in the countries to post-doctoral opportunities at the centers. However, essentially there are two types of training: multidisciplinary production training and discipline specific research training.

Multi-disciplinary production training focuses on general principles of production and is designed to enable researchers and extensionists to respond better to farm-level problems and situations. This type of training is conducted primarily through in-country, regional, and headquarters international courses.

Discipline-specific research training focuses on areas of research for which the centers have a comparative advantage. It is designed to enable national

scientists to conduct research. The research topics treated are of priority to the respective country and application of results could have a positive impact on production. Examples of this type of training are: specialized courses, mid-career training, individualized on-the-job training, M.S. and Ph.D. scholarships, thesis research support, and post doctorals.

Since 1970 CIAT has trained 413 national cassava workers and since 1978 CIP has trained 1,958 potato workers. Figures I and II for CIAT and CIP respectively, show the relation between multidisciplinary production and discipline specific research training.

Both centers recognize that they are not the sole source for training. Whenever another source has a comparative advantage to meet a country's training needs the centers attempt to arrange the training.

Positive interaction of national and international organizations

Although the responsibility for ultimately reaching growers with improved technology rests with national programs, cooperation and collaboration between national and international organizations is imperative and must exist in a positive spirit.

While international agricultural research centers such as CIP and CIAT have comparative advantages, such as sources of germsplasm collected world-wide, providers of improved lines, pools of crop management technologies, and as colleges for training, national agencies have a comparative advantage to transfer the most appropriate technology to their producers. As such, the role of national programs is as important and crucial as that of international agencies. However, how well national programs are able to play this role depends, to some extent, on how well the international and national agencies have interacted and, particularly, what joint manpower development programs have been carried out. Unless national researchers and extensionists are capable of receiving and using new or improved technologies, there is little hope of conducting research and training that will benefit farmers.

National strategy for developing scientific manpower

An overall national strategy is fundamental for developing national scientific manpower. The strategy must be a function of national agricultural research and extension objectives. Research and extension personnel must be able to respond to questions on production problems and on broader issues related to domestic and export market perspectives. To fulfill this type of responsibility national commodity programs should be composed of a wide range of areas of specialization. Each area of specialization's activities should relate to other parts of the program; but each should have separate, discernible objectives. Tasks and level of competency for each task can then be identified. All this requires careful analysis with the intent of developing an overall strategy for manpower development.

Development of a national strategy includes four steps:

First, an assessment of training needs must be conducted. While international centers may assist with this step, the assessment should be conducted by

national authorities and planners. The intent is to identify training needs based on national research objectives.

Second, a comprehensive plan based on the assessment should be prepared. Some options for satisfying training needs are:

- para-professional and bachelor-level training;

This type of training provides essential basic knowledge for both researchers and extensionists; this academic study is generally informative and broad rather than skill development -oriented with insufficient "hands on" field experience.

- post-graduate specialization;

This type of training generally provides the necessary theoretical background and practical application experience necessary to enable the student to conduct reasonable-level research. While some may argue the same may be achieved through short and medium term on-the-job experiences or courses it cannot be overlooked that degree-related training is not only more prestigious but also its benefits are generally longer-lasting.

- short courses; and

While short courses are used extensively to quickly cover the broad aspects of a food crop they have the added advantage of serving as a vehicle to update the participants on the status and availability of latest technology.

- in-country training:

This type of training is particularly appropriate for extensionists who may need to work directly with producers introducing new or improved technologies. It lends itself to teaching by national researchers and extension specialists in the language of the country.

Third, priorities for applying the strategy must be set. Strengthening national agricultural research and extension systems through training is a costly venture. Although the goal is to raise all national programs to the advanced state of development one must be pragmatic and recognize that this may not be possible or desirable either because it is expensive or because their national planning simply does not require it.

Fourth, the strategy is applied. Table I shows a proposed mix of strategy components according to characterization of a country. Assessment of needs is of paramount importance as it sets the precedence for all subsequent activity. In general, multidisciplinary courses at centers are less relevant than in-country courses which are ideal in countries in the more advanced stages. Of course, direct assistance from the centers will be needed in countries in the lesser developed stages.

It is important to maintain cognizance of the fact that implementing a national policy is a long term process that requires step-by-step planning and supportive political decisions from policy makers.

Table 1. Mix of Components for Development of Scientific Manpower of National Research Programs.

COMPONENTS OF DEVELOPMENT OF SCIENTIFIC MANPOWER

Country Category	National Contribution					International Contribution					
	Analysis of National	BS and Technical Level	Multidisciplinary Courses		Post BS Studies	Specialization			Short Courses		
			Research	Extension		Post BS level	MS Thesis	Post MS & PhD Thesis	Multidis-ciplinary	Special Techniques	In country Training
A	XX	XXXX	XXXX	XXXX	XXXX	XX	XXXX	XXXX	X	XXX	XX
B	XXX	XXXX	XX	XX	XX	XXX	XXXX	XXX	XX	XXX	XXXX
C	XXXX	XXX	0	XX	0	XXXX	XXX	X	XX	XX	XXX
D	XXX	XX	0	0	0	XX	0	0	XX	X	0

* Assistance to in country training

1 Relative emphasis XXXX High XXX Medium XX Low X Very low 0 No attention

Summary and conclusions

Five points have been introduced as being essential in an overall strategy for developing scientific manpower for root and tuber crop research and extension through training. These points have been advanced from the contention that the contributions made by international agricultural research centers through training to the developing world may in the long run exceed those of research and that national programs play the most important role in the transfer of technology process to reach farmers.

However, the plan of action must emerge from dialogue between national programs and the international centers. As development of national program capability is achieved and becomes productive, the direct responsibility for training diminishes for the centers while it increases for the national programs. It should be emphasized that this scheme will not have results and impact at the farmer level unless there is a policy decision made at the governmental level, and there is a commitment from national programs.