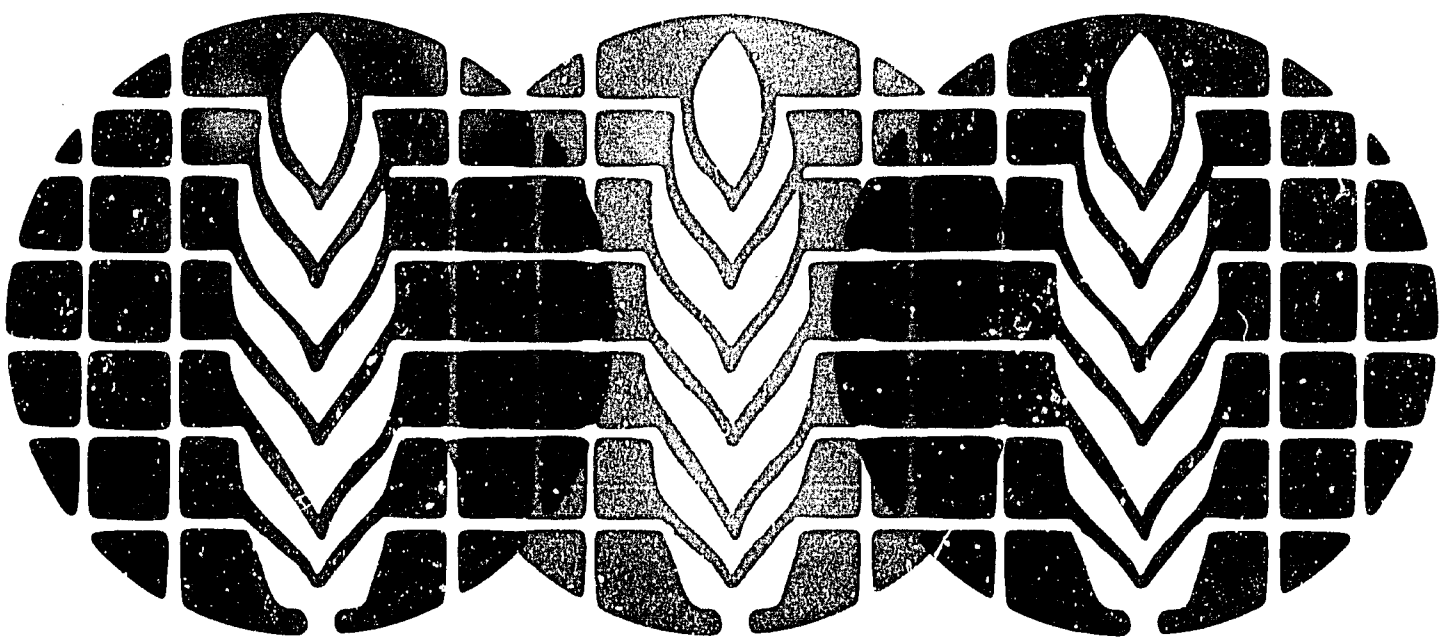
BIFAD
Board for International Food and Agricultural Development

A Forum on Agricultural Research Strategy for Africa

Board for International Food and Agricultural Development and the Joint Committee on Agricultural Research and Development in Cooperation with the Agency for International Development



December 1984
Agency for International Development
Washington, D.C. 20523

AN AGRICULTURAL RESEARCH STRATEGY FOR AFRICA

A FORUM

convened by the

BOARD FOR INTERNATIONAL FOOD AND AGRICULTURAL DEVELOPMENT

and the

Joint committee on agricultural research and development

in cooperation with the

AGENCY FOR INTERNATIONAL DEVELOPMENT

December 5, 1984
Washington, D.C.

BOARD FOR INTERNATIONAL FOOD AND AGRICULTURAL DEVELOPMENT
INTERNATIONAL DEVELOPMENT COOPERATION AGENCY
Agency for International Development
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January 25, 1985

To The Reader:

One of the functions of the Board for International Food and Agricultural Development (BIFAD) is to focus special attention on areas of mutual concern to the Agency for International Development (A.I.D.) regarding the role that science and technology can play in improving the production and use of food in developing countries.

A Forum on "An Agricultural Research Strategy for Africa" was held in conjunction with a meeting of BIFAD and its Joint Committee on Agricultural Research and Development (JCARD) on December 5, 1984. The proceedings of that meeting are presented here, edited only for clarity and conciseness.

Sincerely,

E. T. York, Jr.
Chairman

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An Agricultural Research Strategy for Africa; A Forum

E. T. York, Chairman, BIFAD

This is a special, one might say extraordinary, session for several reasons:

* It is a combined meeting of BIFAD and JCARD;

* The setting is a "Forum" in which we will discuss issues and exchange ideas;

* The focus is on a long-term solution to the problem of hunger in Africa -- a problem at the forefront of our Nation's conscience; and

* Assembled here in this room in addition to BIFAD and JCARD members and our AID colleagues is a panel of very distinguished scholars to help us sort out these difficult issues.

The topic for the "Forum" today is "An Agricultural Research Strategy for Africa." One of its immediate purposes is to assist the Bureau for Africa as it reexamines and further defines a strategy for agricultural research, within the framework of a broad program in development assistance.

Today's topic is most timely. With so much attention justifiably focused on the immediate hunger crisis, we should not neglect actions now to minimize future recurrences of such severe food shortages. Surely the long-term solution lies in developing the capability for sustained improvements in food production in Africa. Agricultural research will be an important key to progress.

Some months ago we explored with AID's Africa Bureau the possibility of a Forum dealing with the agricultural research emphasis in Africa. Today, representatives of the Africa Bureau are with us to bring us such a presentation from their perspective. In addition, several people who have had a great deal of experience in Africa and who have written extensively on the subject will share with us some of their views and perspectives. In addition, BIFAD's Joint Committee on Agricultural Research and Development, which is made up of representatives from AID as well as the university community, has joined the Board for this Forum.

We welcome all of you here to the Forum on "An Agricultural Research Strategy for Africa." It is a topic of vital interest and concern, and we look forward to a free-ranging discussion.

Agricultural Research in Africa in a Global System Context

by

Vernon Ruttan*

My emphasis will be in a global context, with implications for the development of agricultural research systems in Africa.

As background to this discussion, I began to ask myself what kind of a global research system we must have in place at the beginning of the next century to maintain the kind of growth and production we are going to need?

I come to this because we are undergoing in this century one of the most remarkable transitions in agriculture that the world has ever seen.

Prior to the beginning of this century, almost all increases in agricultural production came from adding more land to cultivation. There were a few exceptions -- in the wet rice areas of East Asia and parts of Western Europe -- but the exceptions were very small in the total scheme of things.

By the end of this century, almost all increases in agricultural production will have to come from intensification of agricultural production. Again, a few niches will be left; niches not amenable to traditional pioneer settings. They will have resource utilization problems that will require substantial research and substantial investments.

To me, that implies that by the first decade or so of the next century we will need to have in place in each agroclimatic region in the world, an agricultural research capacity for each crop or animal or resource problem of economic significance.

If that capacity is <u>not</u> in place, the people living in those areas will not have access to the possibility of growth in agricultural production.

If we look back we can see that in the last 20 to 30 years we have moved a long way toward establishing that capacity.

I will talk a bit first about the international agricultural research system; then about national agricultural research systems; and then, what I see as an unresolved problem, the small-country problem.

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*Professor, Department of Agriculture & Applied Economics, University of Minnesota

The International Agricultural Research System

As for the international agricultural research system, we perhaps need first to remind ourselves of what has occurred in the last 20 years. We have a system in place that in some sense is beginning to do for the world what a national system does in a large country; that is, link the regional and the smaller national systems.

This international system has made a difference. One can use many kinds of criteria. Bob Evenson calculated that by the mid-1970's, the world had 12 percent more rice than it would have had using the same resources without the system. Joe Nagy recently calculated that the gains to Pakistan alone from the wheat research conducted by CIMMYT (International Maize and Wheat Improvement Center) would have paid for CIMMYT's entire wheat program from its inception. Clearly, then, one can say that the international agricultural research system has made a difference.

The system is almost the only thing we have in place now that is effective with small countries. In a board of review six or seven years ago, visiting a small station in Mali, we found four young men -- an agronomist, a plant breeder, an entomologist and a pathologist -- who had recently returned from training abroad. Without the linkage to WARDA (West African Rice Development Association) and the international system, those men would have been almost completely isolated. With the system they were able to tie into the germ plasm at IRRI (International Rice Research Institute). They were able to participate in regional scientific meetings. There was a morale there that one would not have expected to find.

At our Minnesota research policy conference last spring, a research director from one of the smaller countries in the Caribbean region commented, "It's okay for you guys from Mexico and Brazil to talk about how you don't need the international system and how strong your systems are, but we don't get anything from you. It's only through our linkage with the international system that we gain access to research in other countries."

At one time there was talk that as the international system matured the host countries or regions would take it over. The Philippines would take over the International Rice Research Institute and so on.

But we have to think of this system as a permanent system, one that will be permanently supported by international resources. Certainly we don't think that the national system in a major country like Brazil or India or the United States will be taken over by its states eventually. Similarly, we need the decentralized national systems, and we need a permanent international system that links them.

It is however an incomplete system, and there are a couple of things that are disturbing.

First, I see a whole set of a dozen or so institutions emerging with support by the same group of donors outside of the system. Potentially, that has some real problems, because one of the things that the CGIAR (Consultative Group on International Agricultural Research) combines is decentralized scientific decision-making with centralized oversight. We need to think carefully about the new ones that are coming up. What sort of oversight mechanism is needed? These organizations do get into trouble, and an oversight institution is needed that can go in and diagnose and move them off onto a useful track again.

Secondly, it is also time for us to begin to think seriously about basic research needs in the tropics. I know there is a great deal of skepticism about the funding of basic research at what are now relatively weak institutions. But as we move toward the end of this century, at least all of the major national systems in the developing countries are going to have to ask themselves where they belong in the whole set of new biology and new biological technology that is coming along. The new institutes are not going to be able to make those decisions unless they have some capacity in those areas themselves.

There are also a number of serious problems in tropical agriculture, such as the soil problems in Africa, the man-disease interaction problems -- that are not going to be solved if left to the institutions in developed countries. Or they will be solved only slowly. There is something about a scientist that is not too different than a rice plant; the environment where a problem is serious concentrates attention. The international community needs to begin thinking seriously about what kind of basic research capacity it should be building in the tropics.

We have some of that capacity within the international system. There is the International Laboratory for Research on Animal Diseases. A large share of its program has been relatively basic. We have ICIPE (International Center for Insect Physiology and Ecology). We have a few other internationally supported institutions. There is talk about others. My guess is that when they emerge, they will have to do so with a separate consultative group.

We also need to think about how one goes from where we are to a truly global system. As I see it, there are not yet the linkages among the developed-country systems, among say the United States, Japan and the member countries of the European Economic Community that are needed for an adequate international research system. There is not the linkage with the socialist countries or the developing countries that there will need to be over time. We have to face up to the problem that even the strongest countries cannot be autonomous in science and technology.

National Agricultural Research Systems

Now, let me turn to some comments about the national research systems. We have gone through three cycles in the postwar period. We had a period of intensive effort devoted to developing national research systems, particularly in Latin America and Asia. Then, for a while we felt that we were handling things by putting the international system (international research centers) in place. As soon as we got the international system in place, however, it became apparent to us that the real constraint on the effectiveness of the international centers was the lack of strong national systems to work with as well as the lack of a strong international system among developed country donors.

The international centers can produce prototype technology. They can produce generic knowledge. But to be effective, they have to be able to work with national systems that have some research capacity. Most of the national systems in Africa do not have adequate capacity. And now, with the establishment of ISNAR (International Service for National Agricultural Research), and many other efforts, we are beginning to ask ourselves what organization is going to oversee and coordinate all these efforts?

We can learn a few things from past experience in building national systems. It has been very mixed.

Let me indicate some of the concerns I have when I look at a number of the national systems. Some have to do with internal administration; some are about donor policy.

First, there appears to be excessive investment in research facility development relative to the development of scientific staff. I can point to research facilities that have been built to support a sophisticated research program that will not have the staff capacity to operate these programs for a decade. By the time they have it, the facility investment will have depreciated.

Second, I have been concerned about excessive administrative burdens that stifle both routine investigation and research entrepreneurship. Many countries have not yet made the transition from how you manage routine programs -- in a sense, post office administration -- to research administration. (And we all know that some of those problems continue to exist in the developed countries as well!)

Third, I have become concerned that location decisions for major research facilities, often made with the advice of assistance-agency consultants, have frequently failed to give adequate weight to factors that contribute to an effective research location. For example, we all know that in most developing countries a professional cannot exist unless both he and his wife are working. If you are not in a location in which your wife can work -- most of the wives are also professionals -- you are not going to stay there. You also have to work in a

place where your kids can be educated. One has to think about the context of research and educational facilities that it takes to make a research system effective as well as the physical location.

The fourth concern has to do with the lack of congruence between research budgets and the economic importance of major commodities. Again, we know that for a country with a very limited research capacity, this is an extremely difficult problem to solve. If somebody comes back and he's a soybean breeder and soybeans aren't very important, he will still breed soybeans.

As systems develop, one has to be increasingly concerned about this problem of congruence. We have not solved it very effectively in the United States. The research dollars per $1000 of value added on wool and sheep is about $34, and on wheat it is about $2, and the others range in between. I do not believe congruence necessarily implies an efficient allocation of resources, but when there is a substantial departure from congruence, one ought to know why.

Fifth, I have become concerned about the apparent presumption in some national systems that it is possible to do agricultural research without scientists. That presumption exists not only within the national systems; many donor agencies have the same perception. I also see too many research program leaders who would be extremely good extension specialists anywhere, but who do not have the capacity to imagine the solutions to highly technical problems.

Sixth is a concern over the cycles of development and erosion of capacity that have characterized a number of national agricultural research systems. When we look at some of the older systems we have worked with, particularly when we look at Latin America, we see a period of 8, 10, 12, 15 years of capacity development. We see the donors beginning to feel that the system has matured; we see the donors beginning to withdraw their support. As the support is withdrawn, we see the system beginning to collapse. We see that the system has not become politically viable in its own environment.

All this adds up to a seventh concern about the lack of information and analysis that goes into the establishment of research priorities and thrusts. No matter whether this is done very formally, informally, or entirely implicitly, two questions are being answered when one makes decisions on where to put the research dollar.

One question is: What are the possibilities of advancing knowledge or technology if resources are allocated to a particular commodity problem, a particular resource problem, or a particular discipline?

The interesting thing about this question is that economists and planners and even senior research administrators cannot answer it. It can only be answered by the scientists who are operating at the edge of the work in their field of technology or science.

The second question is: What will be the value to society of the new knowledge or the new technology generated by the research that is developed?

The scientist is not very good at answering that question. Neither is the scientist who sits in the office of the research administrator. The answer to that question requires social science knowledge. And bringing those two sets of knowledge together -- the knowledge about what can be done and the knowledge about what is worth doing -- is essential, no matter how informal the process is.

The Small Country Problem

Now, let me turn just briefly to the small-country agricultural research issue. We simply don't know how to deal with this problem. We can all talk about it. We have some knowledge, but we have not been very successful at actually working with it.

Even for the smaller countries (until you get down to the Grenadas and really small ones), a minimum national research/education system plus the related functions of the ministry of agriculture in the area of regulations and so on, requires a national scientific staff of somewhere in the neighborhood of 250 people trained at the Master's and Ph.D. level. That number does not put a country in position to do great things in the world; it is a minimum! Something in that range is needed to train people for extension; for agribusiness; for secondary education; to be able to link to international networks and access those networks; to handle some of the regulatory problems that a ministry has to handle.

It is not hard to support that number if you consider a country that has 8 or 10 commodities of some significance, and you think of what it takes to have a research team that can work on those commodities, say somewhere in the neighborhood of four people with some training -- Master's, Ph.D.'s, some specialists. (You will have to work on some resource problems as well as commodity problems.)

Countries with less than 1-1/2 or 2 million people are not going to be able to afford systems even that large in the next 20 years.

Bill Gamble and Eduardo Trigo took this model and tried to apply it to the Caribbean Basin countries. They asked how many of them and what commodities could afford it? There were only about 8 or 10 commodities among all the commodities in all of the

countries that, if 1 percent of the value of the commodity was spent on research, could have what even looks like a minimum program.

Regarding networking, we talk a lot about it, about interdependent systems. But I think we still have to say that the brochures put out by the network headquarters look better than the network activities.

There are exceptions. Some of the networks developed with international centers and national systems seem to be working fairly well. Not all of them. A network presumes there is some national capacity out there, and it also presumes that at least somewhere in the network there is a viable research program going on. That is one of the reasons some of the center networks seem to work and some do not.

A viable network system is also going to require long-term international funding. The regional research networks in the United States would disappear if it were left to the state agricultural experiment stations to support them. It is only because we require a certain percentage of funds to go into them that we make them viable.

We have the same problem with the national systems of developing countries in relation to the international centers that we have with state or provincial systems relative to the national system.

Reforming Donor Support

Finally, the donor community needs to give some thought to how it provides support to national systems of developing countries so that we break out of this pattern of the development and erosion of capacity. One of the things that happens during the period of donor support is that the national system becomes quite effective at foraging for resources in the international community. You become quite skillful at doing that, and actually it is much easier than foraging for resources within your own political system. But what happens is the research system does not achieve the political viability that it takes to maintain itself when the donor resources disappear.

A research director in the U.S. tells me he is having a meeting this winter in each legislative district in his state. That isn't the kind of thing that young directors of national systems learn while they are graduate students in the United States. There are some exceptions. I have not been in the Indian Punjab recently, but when one watched Dr. Randawa and talked to him about how he worked with the Punjab legislature, one saw a very sophisticated operation.

We need to find a way to turn the incentives back inward. One approach would be a donors club that somehow provides external resources based on the increments in internal funding.

Another is some kind of donor support group, chaired by a national research director, that involves itself in joint planning. And when you come to a roadblock (such as the Swiss or Dutch feeling that they have to do artificial insemination), you can find other donors whose resources are not so tightly restricted. In this way, you can fill in the gaps by looking at the total system and what it needs.

I don't know the answer. It is a challenge to us. There are probably other institutional devices than the two I suggested, but I hope in the year 2000 we won't be looking back and saying to ourselves again, "Why do we see these systems evolving some capacity and then that capacity eroding as the donor support declines?"

Discussion

Duane Acker, BIFAD Board Member: Dr. Ruttan, you mentioned the political activity in the Punjab. How many places around the world have developed these political approaches, where political support has been built. I know it would be hard to quantify, but is it exceedingly rare? Are there a dozen? Forty?

Dr. Ruttan: I don't have as much of a sense in some countries as in others. There are about 8 to 10 national systems that account for a very high percentage of all of the research capacity in developing countries. Those would include, of course, countries like India, which have some of the problems I talked about, but are doing very well. It would also include countries like Nigeria, which have a substantial research system but not much comes out of it. It would include the Philippines.

It seems to me the way you do this depends a lot upon the structure of the governments in the countries. Let me just illustrate. I remember traveling in Colombia with the director of the national research system and the former minister of agriculture, and in a provincial town the director waved to somebody and said, "That's a senator."

I said, "My God, if I were in Minnesota and were traveling with our director, he wouldn't be sitting here with me. He'd be over talking to that guy."

And the foreign minister said, "But he doesn't count."

I said, "You mean a senator doesn't count?"

He said, "No. In our structure, if you're going to do any lobbying, you have to lobby with the planning commissioner or the minister of finance. It doesn't pay to lobby your congressman."

Well, if you have that kind of structure, it implies you operate differently to achieve political viability.

E. T. York, BIFAD Chairman: Dr. Ruttan, you made several comments concerning the international research system, the CGIAR system. As some of you know, the system is now, through its Technical Advisory Committee, going through a major priority-setting exercise. We recognize that a number of new centers are outside the system. Looking specifically at the type of research emphasis these centers should be giving, there is the question of more basic research versus more adaptive or applied research that they now do.

You mentioned the need for more basic research dealing with the problems of the tropics. To what extent do you feel that existing centers might need to reorient their research efforts to address some of these needs? What is your feeling with regard to the balance in research priorities within the system?

Dr. Ruttan: I think it would be extremely difficult to transform the existing centers into centers of basic research.

I also think that there is still a very important job of doing generic-applied research, and then linking that generic-applied research to national systems. There will continue to be a very large need for the centers to do that.

They should have the capacity to screen and to take advantage of advances in basic knowledge. That may mean a limited basic research capacity. IRRI (International Rice Research Institute) did some relatively basic research in soil chemistry because it was potentially important to the nutrition of rice plants.

On some problems, where the basic knowledge is going to be relevant to a range of commodity and resource problems, we probably would get more for our buck with less risk of confusing the objectives of the present system by beginning cautiously to build basic research institutions in the tropics. They should be somewhat different than the existing ones; they should be much more closely linked to universities (perhaps not completely administered by universities but linked closely to them); and they should play a much larger role in the training of scientists within the tropics. I can think of 3 to 5 possibilities.

Chairman York: You feel that it would be advantageous to try to develop an appropriate mix between a national university and research station as we have in the United States between state universities and state experiment stations?

Dr. Ruttan: Yes.

Fred Hutchinson: BIFAD Executive Director: Given the high rates of return that Evenson and others have shown that agricultural research delivers, what is the potential for private support for agricultural research.

Dr. Ruttan: We need to explore much more than we have the potential for private funding, not only private funding but private performance in agricultural research.

Regarding my comment that there are not very many commodities in any one country in the Caribbean large enough to support public research at say 1 percent, one does find some individual commodity institutes funded by checkoffs or assessments that are spending more than that because they tend to be things like coffee.

In Venezuela a private research institute does research on a contract basis for the government and for the growers associations.

A contract research relationship with an institute elsewhere frequently makes sense, particularly for export crops in some of the smaller countries. I think we ought to be more imaginative.

I don't see within development assistance agencies, or at least within the agricultural units in development assistance agencies, very many people who are capable of looking at the legal structure of a country and asking whether that legal structure discourages or encourages private research investment.

Peter Oram, International Food Policy Research Institute: Regarding the question of resources going to large countries, about 75 percent of all the resources and the staff are expended in roughly 20 countries. I don't think that means, though, that a number of other countries are not committed to research. Quite a few much smaller countries have governments fairly strongly committed to research.

Another aspect is that the cost of research varies very much among countries. Practically all of the Asian countries come out very badly on the criterion of the relationship between agricultural research spending and GDP. However, if you look at the number of scientists in relation to the dollars of agriculture, Asia comes out quite well. Africa comes out rather badly because the costs per scientist seem to be much higher in Africa, not necessarily to support more efficient research systems.

Sri Lanka and Kenya, for example, are almost exactly the same size and the same composition of Ph.D.'s and others on their staff. One country spends three times as much on research as the other, and they both have reasonably efficient systems.

The question of small countries, I agree, is very difficult. I have been looking at the South Pacific, which is probably even more difficult than the Caribbean. I would like to ask Dr. Ruttan to respond in relation to this. A rather high proportion of commodities which are important in the countries are not covered by the CGIAR system. So you have a problem of small countries which literally can't support a system of their own. They are often geographically isolated and cannot draw on other countries. They are just left very much in isolation.

One answer may be regional research, as in the Caribbean, or perhaps in trying to draw on resources and knowledge from other countries. But in some cases they don't even have the staff to do that. It is a very difficult problem. I do not think the private sector in some of these countries is going to be much help because there isn't an incentive commercially to get involved in research.

Dr. Ruttan: I like the Venezuelan case because it means that in a sense if you have a private sector research institution, it doesn't have to support itself the way a Pioneer Seed Company does, say, out of the sale of seed. Instead part of its support comes from doing contract research for the government. For example, in Venezuela research on coconuts is done by contract for the government. This is a minor commodity in Venezuela, which is probably why the research is handled as it is. Particularly with an export crop like coconut, a smaller country could contract in a similar way with a research institution outside its own borders.

Alexander Love, AID, Bureau for Africa: One issue of particular concern to us is the ability to generate African budgetary support for the research and education institutions. That clearly is an issue with respect to the national research systems. But the reference to WARDA (West Africa Rice Development Association) brings to mind the real problem in Africa of how to support the growing need and the growing number of regional institutions.

A meeting is taking place on WARDA this week, I think, trying to decide whether in fact WARDA will continue to exist. While it certainly has had many problems, one of the major ones has been the inability and unwillingness of the member countries to provide budgetary support. WARDA is part of a system in which a large percentage of the budgetary support comes from the member countries. While these countries are in financial difficulties today because of other factors, there seem to be other reasons involving how WARDA is run that is dictating whether or not these governments will provide support. It is a lack of conceptual support as much as it is the economic condition.

I am not sure how you go about winning support. It is difficult enough on a national scale. I would certainly like to add that to the list of problems.

Dr. Ruttan: My feeling is that it is a losing battle. If you are going to do something regional, you might just as well decide from the beginning that funds to support the regional activities are going to have to come from the outside. But I do think that you need some kind of oversight that can correct the kinds of problems that emerged in WARDA and do it quicker than it has been done.

Calvin Martin, AID, Bureau for Africa: A comment you hear in Africa from the smaller nations concerns the problem of being able to communicate with the international centers. I know you indicated that they felt more help would come from the centers. Yet these smaller nations have problems in getting what they feel are their problems up to the international centers to take a look at. Is this true in other parts of the world where smaller nations are involved? Or is this a particular African problem?

Dr. Ruttan: No. I think it was a problem with CIAT (International Center for Tropical Agriculture) during its early years, for example. There was lots of struggle to get the regional bean network finally going. But we do have a number of successful examples, too. The project on potatoes seems to be working fairly well. Again, to do them, the center has to be funded.

The Role of Science and Policy in Alleviating Long-Run Food Production Problems in Africa

by

Christopher L. Delgado*

My remarks today are based heavily on the research of my colleagues both within and outside IFPRI (International Food Policy Research Institute), especially a set of papers prepared for a conference held in August 1983, at Victoria Falls in Zimbabwe. They include a heavy measure of personal input so I insert the usual caveat about being the one to blame for errors.

I will begin with the end and tell you what I will conclude. You can then judge whether the argument succeeded. The case I am going to argue is:

1. A big bang is needed in Africa on the food production side, and agricultural research and technology are key.

2. Certain useful scientific research directions are implied, and I will give suggestions in this regard.

3. The research processes for sustained technological innovation are not in place.

4. Once the technology is available, or in places where it is already available, there is a crucial need for better infrastructure -- institutions and manpower -- to use that technology.

5. The role of government in Africa and in most countries is necessarily large, and conversely small open lobbies are essential to keep the government on track.

6. Donors might consider concentrating on their long-term role of improving decision-making and knowledge bases, where they particularly do the best job.

7. Institution-building is the way to go in agricultural research.

8. Policy research, like agricultural research, is a continuing process, and outsiders and donors can have the best input through strengthening national systems to do it.

Now we will see if I can support this case.

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I will begin with a few comparative trends in African food production. I will be brief because the facts are familiar to most of you.

As far as we can tell, output per capita of major staples in Africa over the '60s and '70s fell at slightly more than 1 percent per annum. The worst problem long-term has been in West Africa. Net food imports to Sub-Saharan Africa have been growing at an annualized compound growth rate of about 7 percent, meaning that a continent that was a net food exporter in the '60s became a net food importer in the '70s.

In comparing growth rates in the '60s and '70s between Asia and Africa, I would like to emphasize that I am not talking about the growth rates themselves but what has been happening to the growth rates; the change in growth rates.

In Asia, production and yield growth rates grew by about one-fifth. Area growth rates grew by about a quarter, mostly because of double-cropping under increased irrigation.

However, in Africa, area growth rates fell by about a half in the 1970s compared to the 1960s. Production growth rates fell by three-quarters. In fact, during the 1970s, the absolute rate of yield growth was negligible.

This led to the surprising situation that Asia and Africa had about the same rate of growth of cropped area in the 1970s despite the much greater availability of unused arable land in Africa.

Recent developments (I am relying on the most recent FAO figures for 1982 and 1983 for 24 countries of Sub-Saharan Africa facing food emergencies) show a decline of roughly 10 percent in total cereals consumption. Commercial food imports as a percentage of total food consumption are about 9 percent; food aid is about another 7.5 percent. So in the last two years, one could say that total food imports are 16 to 17 percent of total food production -- which for a continent where the vast majority of the population are farmers certainly gives cause to think.

Moving to the framework for assessing the potential for food productivity and growth, some people estimate that about 30 percent of the land in Africa is arable. Nevertheless, there has been undisputed widespread degradation of the resource base. Something on the order of 6 million hectares of good cropland is lost annually to erosion. Whether in the semiarid or the humid areas, the fairly ubiquitous results are gaps of from 40 to 60 percent between on-station and farm yields using otherwise comparable technologies.

Rapid population growth rates, especially in East Africa, (I believe Africa is the only continent in the world where the rate of growth of population is still increasing), suggest that the day when agricultural intensification is required is not far off.

Unlike the situation in Asia in the 1960s, both policy makers and biological scientists faced with African problems are also faced with a number of major uncertainties as to the correct way to proceed.

I am told that there was no doubt about the efficacy of a push on food in Asia in the 1960s. I would guess that in Africa that same consensus does not exist. There is quite a bit of policy debate about concentrating resources on nonfood export crops and so forth.

In Asia, hard choices were made to concentrate on the higher potential areas such as the Punjab but maybe leaving Rajasthan aside somewhat. This process has not been as evident in Sub-Saharan Africa. It is quite possible that the political problem is more complex in Africa, with the overlay of ethnic and national unity considerations in fragile nation states. In any event, the political processes generally have not made these choices.

Also in Asia in the 1960s, there seems to have been a greater consensus on the types of support institutions and manpower development required to get agriculture moving -- the kinds of roads, the kinds of universities, the kinds of research systems.

I am certain that in Africa that consensus does not exist at the present time. In fact, one of the major debates, as you know, is over research versus infrastructure, one might say, and which comes first.

Turning to the scientific side, there are currently major uncertainties in Africa as to appropriate technological directions.

In Asia, there was a consensus that yields must be raised through seed/fertilizer innovations and irrigation, or at least that was the direction to head in to raise yields per acre. It was understood that this would often involve greater labor input, but this was seen as a good rather than a bad thing. Unemployment was a great concern. So seeds, irrigation, fertilizer strategies were more or less agreed upon, and it remained to research to figure out what to do.

In Africa there is a much more difficult labor problem. Africa is generally labor-short in rural areas. It may only be for one or two months of the year, but seasonal labor bottlenecks are very significant. This complicates considerably the scientific job of sustainably increasing agricultural output. At the present time, there is quite a bit of discussion over the viability of seed/fertilizer solutions, particularly in the lower-potential areas.

Turning to the structural constraints to agricultural growth in Sub-Saharan Africa, I will draw up three sets of constraints to support my conclusions:

1. Physical constraints, which we will take as givens;

2. Economic constraints, which might be called semi-givens (not easily changeable by anybody in the short run and possibly not changeable at all);

3. Policy constraints which may be changeable with a fair amount of arm-twisting, or given sufficient conviction by governments.

First, on the physical givens, soils in Africa are typically old, fragile, shallow, with low organic content. Some studies show, for example, that soils in the semiarid tropics of Africa typically have half the water-holding capacity of the semiarid soils in India. They are subject to acidification and compacting, making them particularly problematic for fertilizer use. In the humid areas, soils are frequently leached; high surface heat and hard and frequent rains lead to rapid breakdown of organic material, erosion and compacting.

Generally, I am arguing that it is a difficult soil problem for agricultural research to deal with.

Diseases and pests are ubiquitous and tend to get more difficult as you move into the otherwise higher potential areas, that is, the higher rainfall areas. The disease and pest problem is particularly intractable. Over a 7-year period, WARDA (West African Rice Development Association) screened over 2,000 varieties of Asian high-yielding rices. Only two outperformed local rices, essentially due to disease and pest problems. In the drier zones, ICRISAT (International Crops Research Institute for the Semi-Arid Tropics), which was very optimistic about the potential of moving high-yielding sorghum varieties from India to West Africa, has now retrenched somewhat in that position, recognizing the very difficult disease and pest problems.

Africa is especially variable in its microenvironment for agriculture. This shows up at the country level. Zimbabwe, a country of 7 million people, has five major agroecological regions. They grow everything from drought-resistant millet to humid-zone coffee. Running an agricultural system under these conditions becomes very difficult. And the microenvironment is truly at the micro level. Africa is famous for its cultivation systems that grow a range of crops within the same farm.

Rainfall may be extremely variable in the semiarid areas. Irrigation is more problematic in Africa than in Asia. In the Sahel, irrigable soils may be 8 percent of the total area, 20 percent of the arable area. However, costs of irrigation development range from $5,000 to $20,000 per hectare, depending on the degree of water control, which is clearly uneconomic.

Finally, seasonal labor bottlenecks themselves, one of the most difficult technical problems, stem from the sharply peaked nature of rainfall. Most of the arable Sahel receives more rainfall than the south of France, but it is concentrated in 2 to 4 months. Under these conditions, weed growth, pests and disease blossom in a concentrated period. But hired labor generally does not exist, which for an economist would be simply a way of stating that land is not a constraint. People can farm their own land or migrate to the city, but why work on someone else's farm?

The point I am trying to make is that, unlike the case of Asia, or possibly Latin America, where one is faced with an elastic labor supply and the labor question is simply a cost input to designing technology, the labor question is considerably more complicated for the design of technology in Africa.

Now, moving to the second set of constraints, the economic constraints, what we have called the semi-givens. Perhaps the most intractable and serious contraint on agricultural production in Sub-Saharan Africa is the competing demand for labor from non-agriculture. Wage differentials between urban and rural areas for unskilled labor typically vary from 1 to 5, to 1 to 9, as compared to 1 to 2, or 1 to 2-1/2 in India, and 1 to 3, or 1 to 4 at most, in Latin America.

This comes about partly through history (recently decolonialized areas); partly because of structural aspects, such as large capital inflows. By way of example, in at least six countries of West Africa, between '78 and '82, 25 percent of GDP came from foreign assistance or mineral rents, such as oil revenues.

The cities generally are growing rapidly in most African countries, and in a sense the nongrowth problem in agriculture has something to do with the growth problem in nonagriculture.

Urban bias in policy is very hard to change in new nations, and I prefer to consider this a semi-given rather than a policy issue in looking at how to go about organizing agricultural research.

There are special problems of small, sparsely populated countries that need to be recognized. It is a simple point but a telling one for agricultural research. If you go to most parts of Africa and you want to introduce an innovation, you need 50 percent of the village to adopt simultaneously in order to have an economically viable center to service that innovation. In many parts of Asia, only 5 percent of the population would have to adopt the innovation for the same scale of service operations because there are a whole bunch of villages right next door where you get lots of other 5 percents.

There are also a host of problems associated with small open economies in a hostile environment where it is very

difficult to maintain autonomous pricing or fiscal policies. Often the way you do that is to have a parastatal which isolates your agricultural producer from the world market. We know all the problems with that. There are bureaucratic problems, too. If you are selling cocoa, and the cocoa price is changing by a function of 33 percent from year to year, it is very hard to get away from that given problem.

Turning now to the third set of constraints, the policy-relevant constraints, I would like to list a few, probably well-known but I will give some figures: inadequate support systems, input, supply, research and so on.

Generally the picture is of inadequate delivery systems and support systems, and particularly in the lower-potential areas. It is true that the private sector has stepped in much more in the higher-potential cash-cropping area, or if it hasn't, it has been prevented from doing so. But in the low-potential areas, the private sector has not come forward, even where encouraged to do so.

Fertilizer is generally not widely used in Africa where 95 percent of food production is on smallholder farms. In the area I am familiar with, the Sahel, during the '60s and '70s, I think it is accurate to say that less than 1 kilogram per hectare of cropped area was used, with the exception of Senegal. Generally, continent-wide, the average use rate did not exceed 6 kilograms per hectare in the late '70s. About one-third of the countries use less than one kilogram per hectare.

There are all kinds of horror stories about fertilizer provision by parastatals. In Nigeria, one researcher pointed out that it took 46 weeks to distribute fertilizer from the central federal stores to farms.

Then there is the matter of inadequate infrastructure. The meters of rural roads per square kilometer are lower in Africa than anywhere else. IFPRI research shows that marketing margins of the food grains in Africa are generally about twice that of Asia in comparable kinds of agricultural areas, and that about half of that extra margin comes simply from higher transport costs. That has a lot to do with poor road situations.

Among other policy constraints are inadequate decision processes and a short supply of skilled decision-makers. There is a famous example in Tanzania of one accountant in the parastatal sector for every $13 million of turnover.

Finally, there is the question of inadequate incentives. It is no coincidence that I put this last on my list of policy constraints. It is undoubtedly a constraint in some areas, but it is only one among many.

One reason for caution in pricing policy is that, in fact, the real consumer price of food in 18 out of 23 Sub-Saharan

countries has increased in the 1970s, as would be expected as demand outstripped supply. In many countries the food price is above the world price, whatever methodology one uses to examine the matter, although export crops are generally still taxed.

Fundamental changes in incentives go way beyond short-run pricing policy. There are several research projects at IFPRI that suggest that nonagricultural policies often have a greater impact on agricultural incentives than agricultural pricing policy per se.

It is probably true that most Sub-Saharan governments have gone in for import substitution in industrialization, protected by tariff barriers. So even if agricultural prices are too high and protected, then manufacturing prices are "too higher;" so, relatively speaking, agriculture is too low. In jargon, the effective rates of protection in Nigeria in 1979 for rice and maize were 218 and 109 percent, respectively. Yet the same indicators for batteries and blankets were 600 and 419 percent, respectively.

These are presumably policy-changeable, although I would not want to estimate the difficulties of dealing with vested interests on these questions.

Now I come to my implications for science and policy; the conclusions that I stated for you at the beginning of my talk:

First, the need for a big bang. Marginal changes are undoubtedly important, but the sheer differential between agriculture and nonagriculture in returns to labor (that is, the growth in labor incentives required), show that a big bang is needed. It suggests, perhaps, the need to consider concentrating on higher-potential areas and crops. These decisions are clearly political. They need to be made through, and by, national political processes.

We also need to avoid simplistic conclusions from that. Very often, the high-potential and low environments are all within the same microenvironment. It is a question of favoring one village over another; using a small-scale irrigation scheme in one place rather than a rain system in another. In any case, it requires a lot of politically difficult and very decentralized decision-making that really only the people of the countries can do, but where possibly they could use some donor support for increasing their capacity in this kind of decision-making.

There is a need for innovations that significantly boost returns to farm labor overall on a year-round basis. Even though labor may be fairly abundant in all but one month, one has to increase the returns to labor in that month sufficiently to make it a viable alternative to year-round migration. And it has to be applicable to smallholder conditions where 95 percent of food production occurs.

Second, some research directions:

Generally, because of labor bottlenecks and the absence of an elastic supply of hired labor one can count on at a given price, particular attention has to be paid to the impact of technology on labor use, especially during bottleneck periods. This makes seed/fertilizer innovations especially complex. That is the essential rationale for farming systems research, which is more of a requirement in Africa than elsewhere. There are obviously abuses, particularly if farming systems researchers lose sight of the fact that labor is really the key variable, and that farming systems research is not an end in itself but simply an adjunct of other forms of agricultural research.

Because of a difficult environment, it is clear that Africa can less afford a non-input-intensive development strategy than other places in the world. Increased use of purchased inputs -- fertilizer, pesticides, herbicides -- will be a sine qua non of progress, absolutely indispensable. Because of the extreme variability of the environment and fragility of soils, this strategy must be coupled to greater specificity of recommendations in order to cater to local conditions.

In Upper Volta, now called Burkina Faso, where I worked for a while -- and I believe it is still the case -- there was only one kind of fertilizer, a cotton-complex fertilizer, that is being extended by the research and extension institutions. There is some research in Burkina Faso that shows this practice has been responsible for acidification of soils and also low response to fertilizer over a period of time.

Because of the need to look at seasonal labor bottlenecks and the high climatic risk in many areas, breeding programs need to consider factors other than high-management dependent, high-yielding varieties. That is not to say one doesn't need research. It says you have to pay much more attention to spreading out the peaks in seasonal labor use , for example, and that you have to really pay attention to stability of yield as opposed to just size of yield.

Because of a fragile resource base and rapidly increasing population densities, soil conservation improvement will rapidly become a new priority in Africa. It has not been a priority in the past and raises very complicated land tenure questions. Land tenure, I would say, is a very viable policy issue at the present time in at least seven countries, all in East Africa.

The third general conclusion: the indigenous processes to look at these research questions in Africa are not in place. I am basing this on the consensus of 50 wise people at our Zimbabwe conference. True, there is an unused shelf of technology, probably more so in the high-altitude areas of East Africa, where good policy or better policy might give a one-shot increase. This would not lead to a sustained process. There would not be anything to replace it.

Currently, one sees considerable aging of expatriate input, an important input in agricultural research in Africa in the '60s. Generally, local input in terms of money and people has not been replacing previous efforts. Generally, the national institutional bases needed to coordinate, to prioritize, to provide political constituency are not there. (These are largely statements of senior Africans.)

If Dr. Ruttan is correct that the minimum needs of a national research program, agricultural university and agriculture ministry is for 250 Masters and Ph.D. agricultural scientists, then most African countries are far short. Budgets for research expenditures other than salary are also lacking.

If it is correct that the necessary institutions and processes for sustained technological innovation are not in place, then the first priority should be to build them.

My fourth conclusion: Where technology is available, infrastructure and support systems are key. Centrally provided grid infrastructure, such as roads, are essential to lowering transportation costs. Infrastructure which permits steady growth in the aggregate supply of fertilizer, national or imported, is also essential to pushing growth in their use. Centrally provided infrastructure to handle the import, storage and distribution of fertilizer is then necessary.

The key points regarding infrastructure are the need for decentralized input in the allocation of resources to infrastructure, and the need to prioritize by regions where available technology is such that infrastructure is a major constraint. All my remarks before about the micro variability of the climate point out the great lack of physical supports, such as soil maps, as well as of various kinds of facilitating institutions for service provision, either directly, or to facilitate the role of the private sector, and generally to improve decentralized government decisionmaking.

My fifth point deals with the fact that government's role is necessarily large, thus smallholder lobbies are essential. All I have said points to the importance of public goods in getting agriculture moving -- research, extension, education, infrastructure. Particularly in the beginning, the benefits from these goods are difficult to capture, hence the role of the state in provision.

Complex allocation choices must be made. If one really addressed the trade-off between putting support into infrastructure or into research frontally, there is no doubt, particularly given the relative costs of the two, that one would go heavily towards research. Nonetheless, one has got to go to infrastructure. These are all long-term processes and in a sense have all got to be done together. It is clear there has to be more prioritization of which infrastructure to go into, and this has to occur on the basis of existing agricultural technology potential.

These are complex and disaggregated processes. Again, institutions have to do it, and people are not sufficiently supporting, either at the national level or the international level, the national institutions that have to make these decisions.

We do know quite a bit about how to get agriculture moving. It is not as if there are not success stories. Tea in Kenya, cocoa in Ivory Coast, cotton in Mali -- these are all smallholder systems that have been highly productive. I will add maize on large farms in Zimbabwe as another example.

In those four cases, the common elements were heavy provisions of research; extension of infrastructure by the state; and more importantly organization of the producers who had some way to get back to the ministry when the parastatals were getting out of line, and to secure the allocations to get the things they needed, to get the fertilizer on time.

The sixth point: Donors should concentrate on long-term programs. Generally donors do influence short-run political variables such as food prices, but this may be limited to times of great misfortune, as at present. Furthermore, the decision on the right direction to go may be very complex. We assume we know what the relative price of sorghum or cotton may be, and maybe we do at a given time, but that is likely to change five months from now. There is a need for continuity and constituency in decision-making, but I would submit that donors should try to improve that decision-making rather than supply improved decisions.

My seventh conclusion stated that institution-building rather than disintegration is the way to go. I have been told that in the '50's and '60s one donor called the shots in Asia. In the 1970's and '80s in Africa, the U.S. role has been far more limited. U.S. bilateral assistance to Sub-Saharan Africa in the early 1980s is of the order of 7 percent of official development assistance to Africa.

While it is true that only recipients can truly provide coordination, the plethora of agenda from different donors makes it especially difficult. I cite the case of Zimbabwe, a country with 15 major donors in agriculture, each flying its own flag, and they are all supporting agricultural research through geographically separate production projects. This means the Zimbabwe research service has to put up 15 breeders and 15 soil scientists, all in different locations. Generally the result has been to fragment the national capacity rather than to build it. Most researchers would agree, I think, that the key to research is to build a critical mass, and such situations are exactly contrary.

USAID's support for African agricultural research has been increasing in real terms for some time now; I am told at this meeting that it is up to $75 million annually and that the length

of commitment is also extended. I also believe that a lot of this growth in funding for agricultural research by USAID has been in the context of specific production projects rather than support for the research processes.

That leads to my eighth point, the need for policy research, and all of what I said above is true for policy research but compounded by the touchy political problems involved in any kind of policy-related activity. There is a need for local knowledge, continuity, constituency; but there are also the complex political and social issues.

Generally I would submit as a personal note, though many of my colleagues may join me, that the role of U.S. technical assistance should be institution building, not implementation of service tasks. That is, we need to build the capacity to prioritize and to make hard choices rather than do those jobs ourselves.

Discussion

Benjamin Payton, BIFAD Member: Dr. Delgado, you suggested that donors should take a long-term approach rather than short-term services or other kinds of gains. Given the immediacy and the urgency of the problems of famine and drought in many parts of Africa, what kinds of long-term gain would you suggest ought to be focused on? Does what is going on right now affect what maybe you wrote earlier?

Dr. Delgado: No, it doesn't. I lived through the great drought in Sahel, first as a Peace Corps volunteer, and then later as a resident teacher, doing my Ph.D. dissertation in what was then called Upper Volta. I recall very strongly that in 1974 we were saying, "The same thing is going to happen all over again 10 years from now (those are the exact words) unless certain things are done."

The great lesson learned from the drought in the Sahel was that for the first time, governments and donors really did focus on the need to strengthen agricultural growth, and despite setbacks a lot was done.

Nothing I have said or want to say should take away from the need for urgent humanitarian assistance, for food aid. I certainly would not argue that one should reduce humanitarian assistance in order to provide long-term assistance, given the current crisis.

Having said that, I think we are going to end up with the same thing every 10 years unless governments get serious about agriculture, and particularly about making agriculture a viable, long-term occupation. I think governments are beginning to realize this.

John Mellor, Director, IFPRI: A comment: The tremendous need for infrastructure in Africa, along with a pretty poor year-in, year-out food consumption situation in much of rural Africa, certainly in the drought-prone areas, suggests that one could put these two needs together and come up with effective long-term food aid programs that build infrastructure. Two and two add up to four, and the four is an effective food aid program for building rural infrastructure.

One should know when one comes out in favor of that -- and I do -- that you are going to look awfully foolish many times over the next 5 or 10 years. You don't look foolish if something doesn't get done, but if it does get done, you are going to look foolish because in the process there will be all sorts of mismanagement and inefficiency and building roads in the wrong places and so on. One should probably go in knowing there are going to be horror stories and try to minimize them and do the job.

If one built good infrastructure, institutional structures, local groups, and so on, for moving food aid year in and year out, the tooling up of these to use four times as much in some years when you have a real crisis would be a lot easier than the present situation of trying to move in a lot of food aid with even poorer infrastructural circumstances.

I would guess in Ethiopia, and probably even in rural Kenya, at the present time you can't really talk about using the food aid for the productive purpose of infrastructure. You just have to get out there and get the food kitchens operating. However, if over some time you have been building that structure to use food aid for developmental purposes, I think you could have quadrupled the size of it very quickly and shown somewhat more infrastructure development.

One can put the next crisis together with institutional structures, for getting some long-term development done. I don't know too much about the emergency aid. There is probably not too much you can do this time in the short run because you haven't laid the groundwork for it.

Norman Uphoff, Cornell University: To underscore the point about local capacity, one big thing we have recently is in Zimbabwe, where a smallholder production of maize has gone from 100,000 tons to 400,000 this season. This is a four-fold increase in market production of maize from smallholders who are in rain-fed areas, often with very poor soil and other conditions, but who for the last four years have been getting support from the government, from private fertilizer companies, from church groups, from the adult literacy organizations in Zimbabwe. They set up these small farmer groups, which have been the links to the extension service for fertilizers, seeds, marketing and so forth. They have had the capacity, which could be picked up as Dr. Mellor says, and used very quickly in this crisis in spite of the other ecological adversities.

Douglas Pickett, Bureau for Asia: Regarding this push for investment in longterm infrastructure development and the capacity to do it, I come back to the many cases where capacity is built up, and then when support is withdrawn it drops down simply because the countries do not have the capacity to keep up with that pace. I would like to hear some discussion on that rather serious dilemma.

Dr. Delgado: I think that is largely a reflection of the fact that projects have been initiated in what donors wanted. The projects have gone in whether they were a priority for the country or not.

I believe in increased provision of infrastructures; it has to be coupled with hard decision-making by the nationals who will have to maintain it. The more you leave that decision-making to the nationals, I think the better they maintain it.

As for Dr. Ruttan's point about buildings versus people, I support that. In all the call for infrastructure one should not lose sight of the fact that institutions are built with people. Donors are doing relatively little to increase the supply of that resource they are calling most heavily upon.

Mr. Pickett: Certainly. But there are recurrent costs in human capital development just as there are in infrastructure development. You have to maintain them.

Dr. Delgado: That is true. You have to fill the pipeline, and it is going to be a leaky pipeline.

Peter Oram, IFPRI: You have a problem with the tax base to generate recurrent costs, particularly with small countries. It is easier to put in an AID project than to find the money to support it over the long term. We do have a real problem here.

In the case of providing the people for particular research projects, I think there is some danger that we are now in some countries developing people faster than we are funds to keep them going. So you have an increasing component of expenditure on salaries and a decreasing component on operations and costs. I think Dr. Ruttan was implying a lot of people sitting around without the capacity to do productive work, which is a very bad thing.

Dr. Ruttan: We seem to have a problem of matching the appropriate kind of support; of matching program to the generation of local support capacity.

As I see the problem in infrastructure development -- whether it is physical infrastructure, roads and irrigation systems, or local institutional structure -- if we depend on the concepts of research transfer we are never going to be successful, whether it is from central governments or AID agencies.

The problem really has to be thought of as one of resource mobilization. If the central government is so fragile that it is afraid to see the evolution of viable local government and to give it the capacity to generate revenue and retain revenue and make decisions, then we are inevitably caught in this system of development and erosion. The roads are going to slide off into the jungle.

The issue of land tenure also came up. AID or the AID community may have to think about how it works on the problems of developing local capacity. Some things have to be done at the central level. Probably you can only fund your research system at the central level. But central governments are not going to put money in packages and send them out there regularly to local communities and local units of government until they develop capacity. Otherwise, the resources you transfer are going to disappear shortly after they have been transferred.

Chairman York: The problem of lack of coordination of donor input referred to by Dr. Delgado seems to be a critical issue in many places.

John Coulter, World Bank: We have tried a donor consortium of one kind or another on a number of occasions. One of the major weaknesses, of course, is the countries themselves. I think it is the country which should be doing the coordination. One of the reasons you get such disparate packages of donors is because the country itself doesn't define very well what it needs. The donors come along, and I think the country in its desperation accepts the package. We have to be very careful not to usurp the role of the country which should be responsible for coordination.

Dr. Mellor: When you talk about Africa these days, you cannot help but lay out how incredibly difficult the problems are, as Dr. Delgado did very well. We are only fooling ourselves if we do not do that.

People working in foreign assistance in Asia in the '50s found it very difficult.

It was the conventional wisdom in 1956 that Taiwan was never going to make it because they would never get their exports to grow more than 3 percent a year, which was what was happening then. By 1961, they were growing 30 percent a year.

Some prominent Americans referred to Bangladesh as a basket case. I don't think anyone now would.

I'm not sure that the situation in Africa is so much less likely to get managed. I think it is important to keep that perspective when we focus on what are very difficult issues.

The point I want to make, though, is the large size of foreign assistance in much of Africa now relative to the

situation in Asia in the '50s and '60s. We are talking about massive levels of foreign assistance now, far more than I think was ever moved into Asian countries.

I think this is partly because the problem has become a little concentrated in Africa. We have got most of Asia moving at this point, and for that reason, and perhaps others, we do want to move very quickly.

We have to realize that by trying to move quickly, by moving in very large sums of money (I do not want my comments interpreted in any way that we should not move so much money in), that is creating an additional problem. How do you move that in without destroying all national capacities to raise resources, and most importantly without destroying the lower level, local governmental capacities to raise resources?

One of the many questions we should be addressing is how such large sums of money being moved in from abroad can be used to enhance the national capacity to raise resources and make decisions at the local level.

We probably have not been turning our attention to how you put those two together. It is easy to say that foreign assistance is destroying local capacity, but that is not where we want to be. The question is how you use large amounts of foreign funds to enhance a local capacity. That is very, very difficult, and we probably do not know very much about it, but we should be turning our minds very heavily to that issue.

Priscilla Boughton, BIFAD, Deputy Executive Director: Dr. Delgado, you had quite a formidable list of constraints. Do you see many countries where you could get a critical mass going to overcome some of these constraints?

Dr. Delgado: Yes, I think so. As I say, Africa is not without its success stories. There may not be so many success stories at a national level, but one can certainly find instances within sectors. One should study those and look carefully at them. I cited some.

Looking at Niger, an area that agriculturally is about as desolate as you can find, I think you can find a success story there where there has been political will and supportive institutions and some pretty enlightened U.S. aid.

Chairman York: Very little has been said about relative emphasis on food crops versus cash crops, the comparative advantage, et cetera.

Dr. Delgado: My response has to do with Dr. Payton's comments also. It is fairly clear that most cash crops, nonfood cash crops, are still heavily taxed because of the revenue imperative of governments and the ability to tax a crop that has only one outlet. That is generally not true for most food crops.

Because these crops for the most part are produced on the same farms -- food and nonfood -- and because the marketed surplus of food is so small relative to total production (I would say 25 percent as a ballpark) if the free market were to prevail, there is great reason to believe that there would be immediate shortfall in the marketed surplus of food, and the consequent need for heavy food imports.

Now it may be possible to finance food imports by export crops production itself, or it might not be. There are a host of issues, but in any event it is not inconceivable there would be an emergency need for food aid if those policies were followed.

AID's Agricultural Research Strategy for Africa

Alexander R. Love*

I would like to thank Dr. York and BIFAD for putting the agricultural research strategy for Africa on its agenda. If this Forum turns out to be as useful to you as it has already turned out to be useful to us, I suggest we continue the process at intervals over the next year or two.

I am sure we will not resolve the subject of where we might go in research this afternoon. We could also expand on some of the related issues on long-term agricultural development. I know you have discussed human resources development previously, but it is another part of the research equation we are quite concerned with. Our new manpower strategy paper, copies of which will be distributed at this Forum, provides a picture of how we approach the human resources gap in Africa.

Another related aspect is the broad question of institutional development in Africa, in the context of universities, the independent research institutions themselves, and the government ministries.

We are trying to look at each of these general areas, even though we recognize the complexity of the overlap among them.

As you are all aware, one of the issues in the Bureau today is the whole question of how we focus on the long-term problems in agricultural development in Africa while we are turning so much of our time and attention to the current drought.

In the first 7 weeks of this fiscal year we moved into Ethiopia alone close to $120 million worth of food and other assistance, a fairly substantial commitment. We moved into Africa this year in two months more food aid than we moved in the continent all of last year; and last year we moved more food aid into Africa than we moved during the height of the Sahel drought. So the flow of humanitarian assistance, in terms of both food and related assistance, such as health assistance and other costs, has been skyrocketing.

We have gotten a lot of public attention. When we introduced the concept of a kind of economic policy initiative last year, we tried to see if we could draw the linkage between the short-term problems of the drought, which were of course quite serious in Southern Africa last year, and the long-term problems involved in agricultural development.

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For the United States, the question of how we fit into this fabric is one of our real issues -- both in terms of what we should do with our own relatively limited sources vis-à-vis the rather long, long list of problems that was fairly well laid out on the table in Dr. Delgado's discussion.

We have been following a growth program in agricultural research to some degree based on faith that research was essential to the solution of Africa's long-term problem. As we have put more programs on the books, and as other people have become more interested in research in Africa, we have found ourselves, at least internally, facing more issues about the priority of research versus other investments.

Should we be putting more money into infrastructure? How much money should we be putting into policy dialogue and policy reform? What kinds of returns will we get from modifications in the price structure, more privatization and reduction of parastatals?

There is a fairly active debate going on in our Bureau asking: "What are the returns to agricultural research, and particularly, given the complexity of our program and the limited amount of funds, where should we be putting our money in agricultural research?"

Calvin Martin has been working for the last 6 months pulling together an improved profile of where we think we might be going on research. We concluded some two years ago that we could not do anything without a better dialogue with other donors. Through the Cooperation for Development in Africa, a mechanism for a loose exchange among the European donors, Canada and the U.S., we have attempted to work on a more comprehensive analysis of agricultural research (particularly in the Sahelian zone and the Southern Africa zone) in an effort to see if we could come up with a better profile of what we might do.

We are obviously concerned about the role of the international centers in Africa -- whether they are putting sufficient attention on Africa, and how we might bring them more into the scene, and how we can assist that effort. We have made some progress in this area in the last couple of years.

We have long felt we have to support agricultural research at the national level and build the national institutions. That must be the base on which any long-term strategy is developed. At the same time, with 33 countries, we really don't know what to do about some of the small countries. In terms of our general program strategy, we set aside a number of the small countries and concentrate on extremely selective interventions.

In some of these countries we could select manpower development and work on that. Our feeling, however, is that our staff capability and budgetary resources are such that we are going to have to be extremely selective in choosing among countries as well as choosing among sectors.

In between the national level and the international centers comes the particularly complicated African problem of what you do with the regional institutions, the regional network, the regional exchanges. The WARDA (West Africa Rice Development Association) is an example of a regional institution that has not gone as well as had been expected and at the moment is in danger of disintegrating.

One of our questions in looking at regional institutions is: Could we, through some regional cooperation, whatever the mechanism be, get around the number of countries in Africa and get some economies of scale? How to get some kind of economies in terms of regional focus and to what degree this would provide a linkage between the role of the national centers and the national assistance itself. The countries share some of the same research problems, some of the same agricultural problems.

To the extent we have had experience with African institutions, we have found them extremely complicated to set up. They tend to become fairly high-cost bureaucracies. They tend not to get support from the member countries to the extent promised. I am talking about a variety of institutions, many of them outside of agricultural research.

I am not an expert on the international centers, but I think there is some question of what the expected roles of the international centers would be in Africa. There is a certain amount of potential overlap and competition with respect to who works on maize research, for example. So I think we have some sorting out to do on that.

We are a long way from having a totally clear understanding of where we are going to go in research, and we are particularly concerned about the problem of how we coordinate with other major donors and with the Africans. I do want to emphasize the importance of determining where we plan to go in research (long-term) and how we will coordinate with donors.

There is going to be a lot more discussion of Africa in the media; and more discussion in front of Congress this spring. It would be a mistake if we do not take that opportunity to go beyond a discussion of the immediate needs that we have in terms of humanitarian assistance and get to some of the questions of what is required to support a better long-term effort in agricultural development in Africa.

Overview of Africa Bureau's Agricultural Research Strategy

Calvin Martin*

Africa is approximately four times the size of the continental U.S., with wide variation of ecological zones, ranging from tropical to semitropical and humid tropical to the arid regions in the Sahel area. A wide variety of crops is grown; and large numbers of various kinds of livestock are raised. There are over 2,000 ethnic groups with whom we work in the various countries in Africa.

These countries have, in general, only recently become independent. This has meant that the governments have been consolidating political power as well as formulating institutions for economic development and for research-extension that are very different from those under colonial powers.

Small farms in Africa range from 1 to 5 hectares and grow a very large number of crops. One farm I visited in Burundi had 18 different crops -- both food crops and cash crops -- on a hectare and a half, as well as a number of small ruminants and poultry.

On these smaller farms, the soil is normally cultivated by the hand hoe.

The lack of trained manpower at the M.S. and Ph.D. levels is a serious constraint. A recent FAO report says, "As late as 1969 there were in 14 French-speaking nations of West Africa only 4 universities offering agriculture courses to 350 students. In the English-speaking countries, a similar situation existed with only 154 students graduating in agriculture during the period of 1953 to 1962." This figures out to about 3 students per country.

Another constraint is rapid population growth, which ranges somewhere from 2.8 to 4 percent per year, with some countries now having at least 50 percent of the population 15 years of age and below.

Dietary preferences and nutritional requirements are also somewhat of a constraint. For Sub-Sahara Africa as a whole, for example, about 60 percent of the caloric intake is in cereals and the remainder in equal amounts of roots, tubers, pulses and other vegetable crops and animal products. But regional variations exist and we need to take them into account in designing agricultural projects. AID's assistance is closely related to dietary needs. Most of our assistance goes into cereal, root, and tuber crops; that is where most AID funding is currently being spent.

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*Assistant Director For Research, Office of Technical Resources, Bureau for Africa, U.S. Agency for International Development, Washington D.C. Talk accompanied by slides.

Per capita food production has generally been declining for the last two decades. Yields have stagnated on food crops. Relevant technologies to increase production per unit of land are not being generated or used by the farmers where they exist. Agriculture research systems are generally inadequately staffed and poorly equipped and financed.

We have to remember that research efforts at the time of independence were export-crop-oriented and focused on animal health. Only recently has research attention been directed to food crops, animal husbandry, and social-economic aspects.

AID's long-term goal is to improve the capability of African nations to sustain food production, increase incomes and improve the quality of life.

AID's goal contains two important elements. The first element is that, recognizing the need to strengthen the national research systems, efforts must be tailored to particular countries. The ability to generate and use research developments is important in designing a research program.

The second element is the development of a collaborative research program focused on a regional level. The types of efforts we see needing support include efforts such as the Semi-Arid Food Grain Research and Development (SAFGRAD) project in West Africa; the Collaborative Research Support Programs that are tied in on a global basis; and such centrally-funded projects as the International Soil Benchmark Sites Networks and the Water-Management Synthesis Project.

The Africa Bureau has three priorities:

1. Strengthening and developing national research systems;
2. Developing long-term plans; and
3. Supporting technology development and transfer.

The strengthening and development of the national research systems puts particular emphasis on the training of professional staff. These efforts are in long- and short-term training in the United States with some training in third countries. Currently, AID is funding 180 to 200 participants per year for agricultural research and agriculture in general. Also, on-the-job training is being provided in the countries by a large number of contractors who we have working on a collaborative basis in research projects.

The long-term funding is about 120 participants a year at the M.S. and Ph.D. levels. Estimates on minimum training requirements for agriculture and livestock have recently appeared in FAO reports. Using Zambia as an example of about 7 million population, the professional level requirement for the year 2000 is about 800 scientists. Today, there are probably around 100 scientists. In order to reach the goal by the year 2000, an

annual output of 55 B.S., M.S., or Ph.D. level graduates are needed each year. They are now graduating about 10 to 12 per year.

The need at the technical level was estimated at about 4,000. There are probably about 1,000 in place today. An annual output of 270 is needed.

By contrast, the FAO report on training needs estimates that training institutions in Gambia, with a population of about 650,000, are in balance -- that is, the training institutions with the trained professional and technical staff to meet the estimated requirements of 50 professionals and 250 technical people by the year 2000.

These examples serve to illustrate the critical mass of scientists that need to be trained during the next 15 to 20 years. We need to further define the regional and national level needs for trained people and scientific disciplines.

Two other points from the FAO report: About 3.4 percent of the trained agriculture and livestock staff in the 46 countries of Africa are women. There are two exceptions, Swaziland and Lesotho, with about 24 and 25 percent, respectively. Further, about 25 percent of the teaching staffs in African training institutions have lower than a B.S. level in education, indicating the need for more training.

Our second priority deals with long-term plans. One of our major efforts is to work through the Cooperation for Development in Africa (CDA), comprised of seven donors (United States, Canada, United Kingdom, France, Germany, Belgium and Italy).

CDA donors have outlined six ecological zones to facilitate the cooperation and development of research institutions on a regional basis as well as to coordinate some of our efforts. These zones are: The Sahel; Coastal West Africa; the Congo River Basin; Southern Africa; East Africa; and Sudan.

Why long-term plans, the second priority?

In agricultural research it may take 10 years to develop a sound technology that can be disseminated to the farming community. Our investment in many of these countries has been for only 4 or 5 or 8 years; sometimes less. In some countries, we have been working for 15 years or so, and those countries are generating some technology. By the time of the full adoption of the benefits by farmers, we are talking of a period of another 15 to 20 years.

The third priority is supporting technology development and transfer. We do this through the bilateral projects that support the development of national research and extension institutions and also in some cases regional institutions.

As for the international research centers, four are located in Africa. Another 4 or 5 have outreach scientists stationed in various countries. So we do have a fair coverage from the international centers.

As for the Collaborative Research Support Programs, all seven CRSPs are active and have projects in Africa. The Sorghum-Millet CRSP in Sudan, Botswana, Mali, and Zimbabwe; the Bean and Cowpea CRSP in Malawi, Kenya and Uganda; Management of Tropical Soils, located in the Sahel area. Other CRSPs are Small Ruminants, located in Kenya and Morocco; Peanuts, located in Upper Volta, Senegal, Sudan, Mali and Niger; Nutrition -- Functional Implications of Marginal Deficiencies in Human Diets, located in Kenya; and Pond Dynamics -- Aquaculture, located in Rwanda.

We also work very closely with the centrally funded Farming Systems Support Project that helps us in West Africa, and the Benchmark Soils project.

On the regional level we are supporting projects, for example, with the International Center for Insect Physiology and Ecology, which is focused primarily in Africa. The Bean and Cowpea CRSP in East and Central Africa is another effort we are using on a regional basis.

As for networking, one of our best examples is with the project in West Africa, which is an organization of 25 African states in the sorghum and millet belt -- from the Sahel region arcing down to Botswana. Certain countries in this particular project are getting more proficient in breeding; some in screening; some working on nutrition. As time goes on, I think this will evolve into probably one of our better networks in Africa. The other network we have is the Farming Systems Research Project in East Africa, which is on its third year.

Where will our research efforts lead us for the year 2000? We hope that Target No. 1, the national agricultural research system, is capable of generating technology and utilizing it in a cost-effective manner. We feel that strengthening national systems is the first thing that needs to be done. We have about 25 or so projects in that area, working in strengthening those institutions.

We feel there are probably 7 or 8 countries -- such as Senegal, Kenya, Zimbabwe, Zambia -- that will need a much shorter time frame to develop some technologies, probably within a 10-year time-frame.

There are a large number of other countries that will need a 10 to 20-year time-frame, countries such as Burundi, Somalia, Rwanda, Uganda. There needs to be developed at the national level a critical mass of scientists who can work on production constraints. In some countries most of the technology will probably have to be drawn from neighboring countries, from the international centers, or through the CRSPs.

The second target -- the national research and extension institutions should be fully capable of meeting recurrent funding needs. We hope that by the year 2000 many of these countries will not have the recurrent food shortage problems of today.

Target three is in developing an effective mechanism to link the national research-extension-education efforts to farmers. Several things are going on in this area. One is the Farming Systems Research Projects being supported in a number of African countries, which help tie together research and extension in collaborative projects and through the development of priorities based on identified production constraints.

Another effort is the CRSP program; again, the CRSP works with the universities and the national research systems, to create a bridge between the two.

The fourth target is development of the national capacity to coordinate donor assistance. As has been said several times in this Forum, this has to be done at the national level. We hope that as the critical mass of scientists is trained and put together, the countries will be able to take on this role and do a better job than what is being done today.

I would like now to report briefly on some of the progress -- the success -- that we see being made toward these targets:

In the Sudan, recent developments in hybrid sorghum research have resulted in a variety that yields about 50 percent more under both irrigated and rain-fed conditions. The research on hybrid sorghum was started by the national research system of Sudan in about 1966. In the mid-70's, the CRSPs and the universities were involved, and by the first part of 1980, a new hybrid was released to farmers.

In West Africa, other advance lines of sorghum are being tested in Niger, Mali, and Burkina Faso under SAFGRAD. There are indications that things are moving in this area.

The training of scientists is another success. Scientific manpower in Africa has been increasing by about 5 to 10 percent a year, a fact we may lose sight of once in a while.

A success, or progress made, on the U.S. side is in the improvement of our knowledge-base of the development problems faced in Africa. We have a much better understanding today of many of these problems -- from the fragility of the soil to a better understanding of the cropping systems, planting practices, and intercropping systems. We know of some of the unique insects in Africa that are not found in other places. We also have an understanding of the adaptations of the indigenous breeds of livestock which at first were dismissed.

This better knowledge-base enables us to define the problems and work more effectively on solutions. We know that to reach

our targets requires a large amount of money and manpower. Currently AID is funding approximately $90 to $95 million a year on agricultural research.

In FY '84, commitments on bilateral projects were to 25 countries. The Bureau also has four regional-type activities. The funding for these projects amounts to about $300 million over the life of the projects. FY '85 plans call for some six new projects, amounting to $90 million. There are also plans for two additional regional projects amounting to approximately $20 million.

For FY '86, an estimated $80 to $90 million will be budgeted for agricultural research activities.

Finally, I would like to say that the Bureau for Africa appreciates BIFAD's assistance in identifying and guiding U.S. university expertise in agriculture research that is helping us solve the food production crises in Africa.

Cooperation for Development in Africa -- A Progress Report

Ray Morton*

CDA -- Cooperation for Development in Africa -- is an informal association of seven donor nations that support major development activities in Sub-Sahara Africa. These donors contribute 65 percent or more of all overseas development assistance to Sub-Sahara Africa. There is no other mechanism at this time that covers such a wide range of technical subjects in an integrated fashion.

Informality is important. It has fostered frank and useful discussions between and among African and donor agricultural research scientists and managers.

The seven original country members, named earlier, still participate actively in technical and high-level meetings. In addition, Australia, Switzerland and Japan are regular observers at the technical consultative meetings.

Efforts in CDA are focused through its initiatives. The U.S. serves as technical coordinator in 3 of the 8 development initiatives: agricultural research; childhood diseases; and forestry and fuelwood. Leadership in the other five areas is being handled by the other six donors.

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*Farming Systems Research/Extension Advisor, Agricultural and Rural Development Division, Office of Technical Resources, Bureau for Africa, USAID, Washington, D.C. Talk accompanied by slides.

Attention to priorities in agricultural development involves a systematic process, particularly in the agricultural research area. CDA members work with African governments and regional organizations like the Organization for African Unity, the Southern Africa Development Coordinating Committee, and ISNAR (International Services for National Agricultural Research).

Activities typically include consultative meetings; assessment of needs; research; and training. The key is that CDA at this time facilitates coordination of donor support.

The agricultural research initiative is the most expansive of the eight initiatives, but it also has more variables to consider.

The goal of CDA's agricultural research initiative is to improve the ability of African nations to produce and sustain food crops and livestock production, and to improve the quality of life -- pretty much the same goals of AID and most other donors. The focus is on sustained systems that increase food availability for consumption and do not contribute to further degradation of the fragile eco system.

As can be imagined, any effort of this magnitude takes time, and measurable results occur slowly. Therefore, a fair amount of caution is necessary in assessing CDA's success or failure. However there are two important and positive results for the agricultural research initiatives to date.

To begin with, CDA organized itself into agroclimatic zones that were based on certain agroclimatic variables and geopolitical considerations. There are six zones. The U.S. serves as technical coordinator for two of the zones, the Sahel-West Africa zone and the Southern Africa Plateau. In addition, the United States serves as overall coordinator for agricultural research. Substantial progress has been made in the development of zonal plans in 3 of the 6 zones.

These agroclimatic zones facilitate more accurate comparisons of production constraints and research capabilities when the variables under study are similar.

A second advantage is that efficient sharing and dissemination of research findings can occur on problems in a format that is easily understood by countries within the zone. This is networking. It begins with communication, and it should evolve into coordination, given more time.

I would like to share with you the results of a 2-year effort in the Sahel zone that recently culminated in the Sahel planning document.

Eight country reports were involved, and a follow-up consultative meeting between representatives from CDA, the Permanent Inter-State Committee Against the Drought in the Sahel

(which is a regional organization); ISNAR; and the Sahel nations themselves.

First, all parties agreed that continued collaboration among donors, CDA, other international organizations, and all Sahel countries was important. To facilitate communication and collaboration, it was agreed that ISNAR could continue to serve as convener and should move towards an expanded role as regional coordinator for agricultural research.

The importance of progress in long-range planning was acknowledged. No one wants to see this capacity lost. Therefore, it was recommended that each Sahel country continue its efforts to prepare long-term plans for agricultural research in a 20-year time-frame, with contraints to agricultural production carefully monitored and documented, and with the human and financial resources needed to remove these constraints carefully considered, all with an eye to designing the most cost-effective research program.

Training needs were determined to be important. Most countries are nowhere near the level of the critical mass that has been discussed. The supporting policies, particularly the research to generate the information to make policy for implementing and institutionalizing successful research programs, were likewise determined to be important.

There were expectations from donors also: to coordinate financing; to focus attention on the most needed priorities identified in the planning documents; and to assist with recurrent costs. Most Sahel countries acknowledge their inability to generate currency to meet recurrent costs, but they did state they were able and willing to contribute facilities and manpower if the donors would accept that.

The donors were asked to include socioeconomic aspects in their agricultural research projects to assure that the research they initiate addresses the needs of the small-holder farmer. In addition, specific near-term activities were identified.

Two major near-term activities particularly needed are: network development and an expanded and more efficient information management system for communicating and exchanging research results.

ISNAR was instructed to initiate, with CDA help, regional networks for scientists working in three areas: 1) soil-plant-water relationships; 2) millet, maize, sorghum, edible legumes and other crops; and 3) agriforestry and range management support to reverse the degradation of the environment.

Using the data already created during this most recent planning activity, ISNAR was also asked to expand its information management system to include such things as research libraries

and bibliographic searches, professional journals, mass media programs, and instructional and extension programs.

It is certainly too soon to do much more than speculate on expected results of CDA, but based on discussions in the technical meetings that occurred in the Sahel (as one example of a regional planning process), five accomplishments could occur in Africa with CDA's catalytic role in agricultural research:

1. The inventory and assessment of agricultural research facilities, resources and programs;

2. Long-term agricultural research plans for Sub-Sahara Africa based on a 20-to-25 year time frame;

3. More Africans trained in agricultural research and extension, and particularly in long-range planning of agricultural research;

4. New farmer-accepted technologies;

5. Most important of all, an ongoing forum for CDA members and Africans to exchange information and support activities.

Some personal observations concerning the quality of technical collaboration by the African scientists made during the last year and a half in the Sahel and Southern Africa:

First, agricultural research in Africa requires long-term planning on a continuing basis, and planning that is coordinated and conducted by Africans. That's how you get the commitment. I have sat for hour upon hour and watched them work out very difficult problems, or at least attempt to, and they will work it out entirely differently than most of us in this room.

In this regard, the zonal planning activities completed to date represent a radical departure from the usual process of calling in exogenous project design teams.

As a process to emphasize training, I think it is fair to say that our regional approach under the CDA concept has been a qualified success.

There are now approximately 75 senior African scientists with the ability to conduct long-term planning in agricultural research. For the past two years, Africans assumed the lead themselves for long-term planning. They did not serve as team members or counterparts. They ran the show. They learned how to design a regional research planning study, how to implement it, how to collect the planning data, analyze it and develop a list of conclusions and recommendations that addressed the vagaries of the difficult agroclimatic ecosystem and the realities of their own political system.

There is a computerized data base for 17 countries with timely information on the current status of agricultural research, extension and education programs that USAID missions, U.S. universities and other donor agencies and the African governments should be able to draw upon.

In view of all this, I think CDA is worth keeping.

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Mr. Love: The CDA mechanism which we have been working on for five years is not without considerable controversy within the Agency.

It has taken a fairly extensive amount of manpower. It has tended to have fairly extensive exchange at the capital level between AID in Washington and some of the European donors. We have had continuing problems in extending that coordination to the country level, in terms of working on a continuous basis with our own missions, but particularly with the other donors. Many of the other donors do not have the same size of field representation that we do, and the flow of information from their capitals to their field posts tends not to be so good.

So there is an open debate about what the benefits are vis-à-vis the expenditure of time and energy.

At the same time, when you look at the whole issue of coordination, the World Bank tends to coordinate basically around country priorities, consultative food mechanisms, of which there are only about 8 or 9 active in Africa at the present time. The United Nations Round Tables for the most part have not been too successful. There is no really good mechanism to begin to cut across some of these problems, and CDA is an experiment in that process -- one not without criticism, and not without controversy within our own organization. I hope that it is a mechanism we can continue to work with.

The agricultural research sector has probably gone farther in terms of a case experience than most of the other sectors. Some of the others, such as transportation in Southern Africa, are in fact dormant at the present time.

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Comments from AID's Bureau for Science and Technology

John Eriksson, Deputy Assistant Administrator for Research, Bureau for Science and Technology, USAID:

We have worked closely with the Africa Bureau. From our central portfolio in the Science and Technology Bureau in FY '84 we contributed something on the order of $15.5 million towards agricultural research efforts focused in Africa. About $8

million of that was through our overall contribution to the International Agricultural Research Centers; another $5.5 million through the CRSPs focused on Africa; and finally a little over $2 million from some 18 to 19 other projects in the Agriculture Office of the Science and Technology Bureau.

A substantive point I would like to make is that we have been in dialogue with the Africa Bureau, encouraging moving to a more active approach in supporting zonal research networks, as described by Dr. Morton. We see the research network approach actively involving national research institutions and researchers in the joint planning and review of problem-focused research, and then providing the relevant training and technical backstopping to these research networks, as a cost-effective way to pursue problem-focused research when faced with scarce resources.

We have been talking with our Africa Bureau colleagues about identifying a limited number of critical problems, generally moderately-focused topics, to concentrate on a zonal basis for promoting zonal research networks.

Some are underway in various parts of the continent, such as sorghum, millet and maize, but one might add beans and cowpeas and other edible legumes, roots and tubers, especially cassava, and small-scale irrigation.

John Robins, Agency Director, Directorate for Food and Agriculture, Bureau for Science and Technology, USAID:

One of the striking points brought out in the discussions is the labor relationship in contrast to that in Asia. The problems in Africa are tough problems.

We are also working by and large with very fragile, old soils in Africa as contrasted to those we find in several other parts of the world, including major parts of Asia.

The difficulty of inter-donor coordination has been stressed. We may have some problems in inter-bureau coordination but we work pretty hard as we look at our programs and how they relate to what the Africa Bureau, and other bureaus as well, are attempting to assure that our resources are supportive and complementary and not duplicative.

That, of course, gets to networking, which has been discussed in this Forum in two or three contexts. Much of our effort is now looking at networking as a major mode through which we can make resources more additive and less competitive through networking on problems of common interest among countries.

This is particularly important in the smaller countries where you cannot clearly develop, in our lifetime at least, the critical mass that has been mentioned so many times and a concept that I certainly subscribe to.

I also want to mention animal research in Africa. The labor problem and the need for increasing the efficiency of that labor pool, particularly during critical times of the year, is one dimension.

A second dimension has been illustrated by the Director General of ILCA (International Livestock Center for Africa) in 2 or 3 presentations that I have seen. In the African context, at least in ILCA's analyses, the animal is the principal income-generator for small producers in many areas. Crops are not, in general. The Director contrasted the cash income from several countries with few animals and several countries with quite a number of animals. It is clear that the income stream is generated largely by animals rather than sale of excess food crops. (I don't think that plantation crops were included in the analyses.)

Another interesting relationship is that as crop production is increased -- (several case studies were used) -- the animal-carrying capacity increases dramatically and thus generation of income through the animal. It is a really quite convincing analysis that there is a correlation between crop production increases and animal production increases in that context.

That leads me to some confidence in investments in animal research that we are making through ILCA, through ILRAD (International Laboratory for Research on Animal Diseases), and through ICIPE (International Center for Insect Physiology and Ecology) in a special project that we have there on the tick-borne disease problem.

I wanted to just mention those relationships to highlight the fact that even though animals are not a large part of the diet of Africans, they are damn important to their pocketbooks. And that's an important part of the developmental equation.

Reactors:

John Axtell, Lynn Distinguished Professor, Department of Agronomy, Purdue University

A couple of general comments first. From the kinds of things I am hearing here in this Forum, I think we are finally getting to the point where we are going to do something about the most pressing problem as I see it from my experience with students and research programs. That is, to really get at infrastructure development, university development, research program development. It is a question that I have been wondering about for 10 years, after working for 12 years in Africa.

I should introduce myself as a plant breeder, working on sorghum and millet with INTSORMIL (Sorghum/Millet International

Research; the Sorghum/Millet Collaborative Research Support Program). When I was a graduate student, all of the focus in Asia and Latin America was on university development, institutional development. Suddenly, when we got to Africa it seems to have stopped; not precipitously, but it seems to have stopped. I really think if it had not stopped, we would not have the situations in Africa today that we are seeing in the Sahel, Ethiopia and other places.

I am really happy on behalf of my African students, because this is such a pressing need that has been known for a long time. I am absolutely delighted to hear what seems to be a general consensus or a general recognition from people in policy-making positions that this has got to happen.

And I think it will happen. If there is a will, I am sure we will find a way, in spite of all the problems that have been talked about. Nothing that you could have said would have pleased me more than to hear that these kinds of things are really being seriously considered.

A couple of experiences. First, the university development program at Alemaya, College of Agriculture, Ethiopia, that went on with AID support for many, many years, was a tremendous program. The College of Agriculture at Alemaya, in spite of the political problems, is still a viable institution. We work all over Africa with the students who were trained at Alemaya. We work with them at ICRISAT (International Crops Research Institute for the Semi-Arid Tropics). Some of them work for CIMMYT (International Maize and Wheat Improvement Center).

A whole host of new students who were trained at the college level at Alemaya have played tremendous roles -- not in Ethiopia, much to their own consternation, because of the political problems. But those people were trained there, and some of them are still in Ethiopia, by the way. In any event, that was a tremendously successful program, and we need to repeat that kind of experience in many, many places all over Africa.

If I had one comment on the paper by the Africa Bureau, I would just caution that developing the national agricultural research programs is a very high priority, but the universities and institutions that will staff and will man those extension programs and research programs in the ministry must also be developed.

I think I detected a bit less emphasis on university development, and I guess I'm asking the question for someone to address. I picked up a little less emphasis on university development than on institutional development vis-à-vis national agricultural research programs. The national agriculture research programs are badly needed in sorghum and millet. In all the countries in Africa, there are probably only one or two good viable national sorghum and millet improvement programs that have adequately trained people and adequate institutional support. So

it is no wonder we are in the situation we are. It is just no wonder.

I remember a comment by Dr. Mellor at the Asia Food and Agriculture Officers program in Hyderabad when someone asked him a question about what is needed in Africa. He said, "This is the kind of thing that's needed: You might just as well buckle down and settle back for a 20- or 25- or 30-year effort and get prepared for a lot of criticism in the process by people who say, 'It isn't working; it isn't working.'"

So I think the focus on institutional development and human resource development is absolutely essential. In spite of the problems, we have got to do it.

The emphasis on the long-term is absolutely necessary. It takes a long time to train graduate students. It takes even longer for them to find a spot where they can really become effective leaders in their program.

I would like to make a plug for the kind of program that INTSORMIL represents in terms of additional training components. It is important not only to train people until they get back to their own institutions, but it is also important to develop working relationships with them for a few years after they get back home. Many of them get back and work under pretty harsh conditions and circumstances compared to what we have.

The tie with a collaborating scientist in a U.S. university is a very important life-support system for them. It keeps them tied in with the germ plasm development programs in the international agricultural research network. We are tied in as well with ICRISAT, and this makes them a part of the network. It doesn't put them out there in a country where they are off by themselves. This is a very valuable role that the INTSORMIL CRSP and the other CRSPs (Cooperative Research Support Program) can play.

I would like to close by commenting on the point that Mr. Martin made regarding the development of a sorghum variety in the Sudan. We have been involved in that for a long time. I hope you do not interpret this as a self-serving comment, but I have been involved with it for 12 or 15 years, and I think it is a useful case history in understanding how something like this, which is a potential success story, really came about.

I should emphasize that this is a hybrid sorghum for Sudan; it is not a pure-line variety. Some of you may already be asking the question: "Should you really be interested in a hybrid for a third world country?" We think the answer is yes, but you will have to make your own decision on that.

If one looks at sorghum production in Latin America, there has been a real revolution. The story of sorghum hasn't been told very often. There is an article coming out in Science

called, "The Second Green Revolution in Mexico." That revolution is in the production of sorghum, and it has been done with hybrids.

There are a lot of hybrids in harsh environments doing well in many developing countries. Although it is not true across-the-board that hybrids do better in all situations, hybrids in general have more stress tolerance than pure-line varieties. We work with sorghum under stress environments in many countries.

The program of introducing hybrids in Sudan started in the 1960s and sort of mulled along for 10 to 12 years with the Sudanese not really knowing what they should do with it. The program actually started with an American plant breeder who was working on a research program in Beirut with the Rockefeller Foundation. He became interested in Sudan and introduced some hybrid varieties from Texas. Sudan, of course, over the years has had a lot of well-trained people, excellent scientists, working on the Program under very difficult conditions with no support from their governments. This stage of 10 years of research was probably important to get them used to the idea that maybe hybrid sorghum could work in the Sudan.

The ICRISAT hired a sorghum person with the United Nations Development Program six years ago. He immediately began testing experimental hybrids, several hundred of them, and selected three that had good adaptability under both irrigated and rain-fed conditions. He identified one of those three as an easy-to-produce hybrid -- what people in the trade call a grandmother hybrid, which just about anybody can produce.

That is the one the Sudanese have released; it is called "Hageen Dura Number 1."

Throughout this development process, the scientist had very important support from the AID Mission in Sudan. Eric Witt and Joyce Turk, who were on the staff of the Mission at that time, were very important in supporting INTSORMIL, CRSP, which sponsored a key production workshop in Sudan on hybrid sorghum seed production and multiplication.

The new Hageen Dura hybrid was successfully produced on 4,000 acres last year for seed multiplication purposes. Next year the hybrid will be produced on 100,000 acres. The average yield this year under irrigated conditions for a local variety (non-hybrid) was half-a-ton per acre. The average for the new hybrid was 1.7 tons per acre. This yield resulted not only from the quality of the hybrid but also from increased cultural practices such as weed control and fertilizers. The maximum yield so far is up to 2.8 tons-per-acre, a 5-fold increase. The average increase was 3-fold.

I mention this because I read over and over again that we don't have the technology to know how to do these things in Africa. It is true that we don't know how to cope with some of the

really tough situations in Niger and Upper Volta, in those sand dunes where we're trying to grow crops. The problems are extremely complicated. But there are situations -- and I think we need to search these situations out -- where we have the technology, where we know what to do, and we can do it if we just have the right kind of trained people. If you look at the history of the development of this hybrid, it traces back to one individual who persevered and got the job done.

So these programs can work. There are success stories in Africa. There are not going to be a whole lot of them until we finish the institutional development job. On behalf of my African students, they really need these kinds of institutional development programs if they are going to get back and work successfully and develop the kinds of crop research teams that are needed, the kinds of teams that were available in Asia on rice.

The last point I would like to make is to second what Dr. Ruttan said. If we could get some well-trained people with viable institutions into some good situations in Africa, a lot could happen.

The other critical thing is if we can do it without a whole lot of bureaucracies, that would be so much better. (Don't feel that I am talking to you particularly!) One of the reasons the Rockefeller Foundation people were successful with the wheat and rice work was that they had a tremendous amount of flexibility. They knew what had to be done, and they had the flexibility to do it.

We know what needs to be done in many, many situations in Africa. If you can give us an opportunity for flexibility to get it done, we'll get it done. I think it is as simple as that. It is a matter of will -- a matter of commitment and a long-term effort.

Dr. York:

One comment here to reinforce Dr. Axtell's very strong suggestion of the need for a long-term, institution-building commitment.

AID decided to make such a long-term commitment in India back in the late 50's and 60's. Three of us here today were in India the past two weeks as representatives from the six land-grant universities that had been involved in university development in India in the 1960s. I wish everyone could have the experience of seeing not only those institutions that had the direct linkages in those days but also those that have been develcped along the same lines since. India now has 23 agricultural universities developed along the lines of the original models.

I cannot begin to tell you the impact that those institutions are having, have had, and will have, upon Indian agriculture. It occurred only because there was this long-term commitment by AID. It is that type of commitment that must be given to Africa at this time.

Dr. Mellor:

I would like to say several things in a different way from what I thought I was going to say earlier. I would like to come in on the university topic. This is terribly important. Some day some Marxist is going to look at what was done by USAID and their institutions in Asia and say, "See. Those guys figured out how to get development. Then, they went to Africa, and they decided they wouldn't make that mistake again."

Brace yourself for that.

I would like to elaborate a bit on the India experience. We probably withdrew too early. Those institutions are still awfully fragile. I think they could have come faster and farther if we had kept up a little bit longer out there. A couple of them are down a bit now, but fortunately I think the system is strong enough so it is going to keep going. I think we could point to a whole lot of cases in Latin America where we went away too soon, and the systems have just gone downhill. They are very, very fragile, and it takes a long, strong effort.

I would like to add another related point. There is a tremendous pressure and burden on the CGIAR (Consultative Group on International Agricultural Research) in the training area. The donors are asking that we work collaboratively and help build up this raw material being talked about and give them something to lean on when their national systems weaken a little. Give them some continuity.

But we cannot provide that underlying foundation of people to work with. We are all out there competing to work with the same small set of people, particularly in Africa. There isn't enough effort being made to expand that supply of people. The CGIAR system cannot give those Ph.D.'s. We can upgrade the Master's people, and the Ph.D. people somewhat, if the underlying supply is there.

It is interesting that the whole thrust in AID, particularly in the last several years -- this long-term look -- is very consistent with what we have been saying here. AID has a much longer-term view than it had in the interim period of '65 to '75 or the late '70's, and I am tremendously encouraged.

Along those lines, I want to say two specific things. I always worry about the use of manpower studies in looking at the training function. We have got to take for granted the tremendous leakages of personnel that we are training for one

purpose and who go into something else. I am not sure it is particularly bad that people trained to do research are leaking out and getting into all sorts of organizations. I think we give them pretty good training. While they are getting their Ph.D. in plant breeding, they look at institutions and they learn something about institutions. There are going to be a lot of leakages, and we have just got to train five times as many people as the manpower studies suggest need to be trained.

Apropos of that, one of our people in IFPRI (International Food Policy Research Institute), who is looking at research development systems fairly closely in Africa, now puts a lot of emphasis on how you keep the people in the middle ranks. There are a lot of good young people out there, some pretty good senior people, and practically nothing in the middle. They are going out of the systems almost entirely. That is part of what I indicated a moment ago -- that there are other very important things that have to be done. Partly we do not have very good incentive structures in the middle of these systems to keep them going.

I would argue that agricultural research is of such an incredibly high priority that we need to give financial and economic incentives to keep scientists doing research into their late 30s and 40s, which is what happens in this country. You keep doing research until you are quite old in many cases!

This is not happening very much in Africa. They are getting out of it when they are still pretty young.

Another thing I hadn't intended to say when I came here is a self-serving remark for IFPRI about policy research. We are beginning to realize that we are dealing with some very difficult new problems on the biological science side in Africa, and we need research to get at them. The same thing is true in the policy area. I would like to make a distinction between socioeconomic research in the biological science context, which is very important, and research on policy.

We are putting too heavy a burden on the biological scientist to deal with a whole lot of problems that are more easily dealt with on the policy side. We are told we have got some serious problems; we carry the word back to the biologists that they have got to breed a variety that women can grow; or a variety that grows on rocks, or a variety that does not require rainfall, and so on, or breed a variety to produce at a very low price, et cetera.

There is not enough effort on the socioeconomic research that leads to change in some of that environment. We do need new knowledge to do that, just as we do in the biological sciences. We need new knowledge on the socioeconomic side in order to get at those policy issues.

I would not have made such a self-serving remark except I think there really is a problem in grasping this. Probably the best way to put it is as I put it -- in terms of the biological scientists. We are putting a superhuman burden on the biological scientist because we are not doing our job on the policy side of understanding policy problems. I think that is very inefficient. They have enough problems in breeding varieties that will produce more somewhere without having to solve all the social science problems along the way.

In that context, I want to respond to the point about hybrids. I do not want to join that battle. I know there are some very technical points. The point I want to make, however, is that you should not turn away from hybrids because you think you are dealing with countries and people that cannot reproduce hybirds and cannot absorb them on their farms.

This is just not the case. We do have some difficult policy problems to solve if you are going to go the hybrid route. But if you think you can get higher yields from the hybrids than you can from other groups, turn to your policy research people to try and figure out how that is going to be absorbed in the societies we are dealing with.

And don't say the small farmers can't grow hybrids. Again, that is a policy problem we need to deal with -- how you get hybrid seed down to the small farmer with the credit programs and all the other things that have to be dealt with there. That is a very important point.

I want to emphasize a point Dr. Delgado made. I think he is very right in saying that we need some breakthroughs, and we need something more than a small marginal change. The Sudan story is very important from that point of view.

What really turned things around in Asia was the drama of the green revolution. And it was a drama there. A survey done back in the late 1950s in India as to who was the most important scientist in the country showed it was Homi Baba, a nuclear physicist. He was the guy who caught the fancy of the country. If that question were asked in the late 1960s or early 1970s, Swami Atham, the geneticist and plant breeder, would have been the guy. There really was a swing. If it is seen that agricultural scientists can do very exciting things, the public and politicians get a sense of the drama that can come out of the agricultural sector.

I want to close on one rather complex note. We have done a study at IFPRI, comparing the effect on non-agricultural sectors of growth in agriculture in Asia and in Africa. We find those multipliers, the effect on other sectors, much stronger in the Asian context than the African context. In a sense that is one more bit of bad news about Africa.

There are two very important points to make on this. One, the leadership in African countries is interested in a broad development process. They want to sit down at the table as important people in important countries. And they know what we all know also -- you don't do that by remaining entirely an agricultural country. You want broad economic development.

The message we can sell very clearly in Asia is that the way to get to that table and have broad development is to get moving in agriculture. When you get agriculture moving, that has linkages and multiplier effects on the rest of the economy. It moves you up to being substantially a nonagricultural economy much faster than if you ignore agriculture. This is a very important message.

We have to sell that message in Africa -- in circumstances where the linkages are a little bit weaker at the moment. That means you have got to understand why these linkages are weaker.

My guess is largely because of the physical infrastructure. The transport systems and communications systems and such are so much poorer. It is something we are working on. It is a very important issue, and I emphasize it because you have got to get that point across if you are going to get the finance ministers, the planning ministers, and a large part of the population behind you in pouring resources into the agriculture sector.

This is an uncertain sort of note, but perhaps that is where a research person should end -- on an uncertain note.

Vernon Ruttan:

I would like to reinforce the point that we often have stopped projects too soon. I have often wondered if we couldn't use the strengthening grants to engage in a sort of project completion collaboration. I wonder if that would not be a very productive thing to do.

I wish I could be quite as optimistic as John Axtell. I am optimistic in the sense that I agree that we understand a lot better. I like the view that AID is now beginning to take a long view. But I have a feeling, at least as far as Africa is concerned, that the Agency is taking the long view but has short resources.

I also have a feeling one of the reasons we are not doing it like we did in Asia is that the United States is just one of the Seven Dwarfs over there now. The World Bank is Snow White.

A question we haven't talked at all about has to do with the things that inhibit human productivity in Africa. I have a sense that the man-disease interaction is extremely important. It is not only the soils that are old; man is old in Africa. There has been a co-evolution of things that feed on his blood and live in

his guts and he eats the blood of the animals and lives in their guts. In some cases, intensification, such as with the tsetse fly, may help control the problem, but in other cases intensification worsens the problem.

I do feel that at some stage those of us in agriculture are going to have to interact more effectively with the people in the health areas, particularly the parasitic disease area, and ask ourselves what we are going to have to do to enable the human agent to be more productive.

If I am wrong, I would appreciate somebody telling me why I am wrong.

Discussion

John Coulter, World Bank: From the perspective of the World Bank, we are both contributors to research in that we support various programs, but we are also consumers of research. This is an interesting dichotomy. As supporters of research we take a long-term view, but as consumers of research we take a very short-term view. Our colleagues in projects are always looking for technologies that can be built into their projects tomorrow. This is one of the problems we face. It comes back to the definition of what is available, what can we use now?

Returning to the topic of the international centers, their success in Asia has been predicated to a great extent by the strong national program. By and large these don't exist in Africa. I think the international centers must ask themselves the question: What can we do in the absence of a strong national program?

They have two routes, really. One, of course, is institution-building. The other is to get themselves involved, either directly, or indirectly through networks, in generating new technologies, in collaboration with the national program, of course.

The question of institution building is an area in which we are extremely interested. It is an area where collaboration could be extremely useful.

Another aspect is commodity development or program development. I think that is shorter term. The international centers themselves are involved in it. There are the bilateral programs of course. There is a good deal that can be done here in developing technology over the next 5 or 10 years which can be used in agricultural development.

Another area is the question of inputs. By and large there is not a major effort by international centers on the use of herbicides. I wonder if there isn't scope for more collaboration in that field.

Dr. Ruttan mentioned the question of health. A lot of mileage could be gained by improving water supplies, rural water supplies, fuel supplies.

Another extremely interesting question is cash crops. In the past, of course, there has been quite strong research on cash crops; in colonial days. But this has folded up.

I think in Africa we are looking to the role of international centers, the regional networks, the regional programs, the other international efforts being supported by a number of different governments, institution-building in the national programs, and program development, to provide shorter-term answers.

The problems are complex but can be broken into areas of collaboration and cooperation. If you look into these I think you can come up with some useful answers in the next year or two.

Fred Hutchinson: In Brazil last week we saw a very strong central agricultural research organization built by AID funding years ago. Most of the people were trained in this country and some in Europe.

Now there is the realization that the universities are not as strong. Several of them, in fact, have grown weaker because they did not have the same access to funding. The strong research organization now recognizes that it does not have the pipeline supply in its own country, and it does not have the resources to keep sending people to other countries for training.

There is a real message for us in these other countries -- that these things have to be done together. If we get too far out of sync, in the long term it will show up.

Dr. Mellor: I have a very short comment on university training. It seems to me AID has a very strong focus and a clear plan of action here moving down the road.

We really are concerned on this issue of the pipeline of people to work in the programs. But one of the things that has been lacking, as seen on the part of the donors, is a sense of focus. The fact we did not come down on that I think should not distract from it.

Mr. Love: On the question of university-building, we were not trying to play that down. We think it is very important. The paper on distribution of manpower was the completion of a first step -- taking a look at the issue of addressing manpower shortages in Africa.

We also sponsored a conference in Cameroon about two months ago, the primary focus of which was agricultural education, from the primary level up through the university level. That conference was attended by the Bank, the European donors and the Africans.

Following that, a small external advisory group was set up to work with us on the whole question of agriculture/university-building in Africa. Our Administrator, Peter McPherson talked about what happened in India, and the question of whether we could duplicate what happened there in Africa. There, you were working from inside the country, and now we are working in a different continent with multiple countries and the problem of coordination.

We are looking at that issue and are considering a conference sometime in the spring to focus on it.

Clearly, we think university-building is an important component. I don't think we have a good feel yet of how we go about it. We don't think it is necessarily parallel to what was faced in India. We keep coming back to the question that we are not the same major domo in Africa that we were in Asia.

We do have the problem of how we, as one donor, influence the input of a variety of donors in tackling this problem as well as a lot of other problems. We think there has to be a mechanism for bringing the European donors, who are major sources of manpower training certainly (the British in particular) into this whole equation, and to try to get some sort of agreement among the donors as well as the bank itself as to where we should go on these things.

It is on our agenda. And anytime we forget, Mr. McPherson, reminds us it should go back on our agenda.

We are getting as I am sure you all know, a very strong push from Mr. McPherson. He makes sure that as we get caught up in shorter-term priorities that we try to maintain a balance and keep a longer-term perspective. He had a background in this particular focus before he joined the Agency.

We do run into difficulties when we go up to Congress. There is still a very strong group that goes back to new directions, new mandate, basic human needs; that has some real questions about the alternatives for investment in Africa; whether we should go to hands-on types of programs.

I think Africa got short shrift partly because the Agency's development policy changed during the 70s, a time when the investments were made to a considerable degree in Asia, South Asia, Latin America. They were able to weather that change through a new sort of framework and without near the disruption it caused in Africa, where the institutions were not on the ground. It caused problems in terms of infrastructure.

From my personal observations in the Agency, and I was in the Asia Bureau at the time, the lack of institution-building programs in the latter part of the 60s and 70s was not a deliberate Agency policy. Those of you who had anything to do with the Agency at that time know we came up against the Senate Appropriations Committee in project after project after project. We had problems in support of that function (institution building in Africa). So the environment was not too good in the Congress. Today it is better, but I don't think it is uniform.

To some degree, we have faced the same kind of dialogue with the Private Voluntary Organizations Committee. There again, their emphasis has tended to be very much on humanitarian aspects -- the shorter-term action programs where they can directly show benefits. They are obviously a major claim on budgetary sources.

There we have the problem. I don't think we have come as far as we should, although we have made some progress, of trying to build a better understanding that we are going to have to focus on some of these investments over the long term if we are going to reach some of the objectives we all tend to agree on.

I think there is considerable risk that we might get off this railroad and give the burden to some of the other priorities, some internal and some external.

One of the reasons we wanted to have this kind of a session and one of the reasons we are going to be talking to the Research Advisory Committee later this month on university building and some of the other issues, is to try to

get a more concrete program of where we really want to go;

get a little bit beyond this level of generalities that people tend to agree on;

get down to the point where we can really lay out a more concrete and long-term program with some estimate of what the budgetary resources would be to support that kind of proposition;

determine how we would interface with the international institutions and how we can support that without getting into arguments about whether our money should go here or into policy reform, or investments in infrastructure or whatever.

So we still have an awfully long way to go. I think we have a very good environment for doing it now. The interest in Africa that has been heightened by the drought provides an opportunity to drive home some of these messages. We still have a lot of work to do. And if we don't do it properly now, two years from now we may not have the opportunity.

Dr. Axtell: May I make a quick comment before I get a lot of letters saying, "You can't produce hybrid seed in Sudan." I want to point ou that the seed this year was produced by 188 farmers on farms ranging in size from 2-1/2 to 5 acres.

Chairman York: I wish to reflect the sentiments of everyone here, certainly of BIFAD, that this has been a very, very productive Forum.

This Board will be reflecting on this session as we have a chance to study the minutes and the key points that have been made. It will be developing its observations and recommendations, perhaps, to the Agency.

A very strong consensus has been reflected in this Forum today concerning the vital role that research and educational institutions, and institution-building, must play in Africa.

Mr. Love: You may wish to think about whether you would like to do this again in a couple of months.

A topic we would be very interested in covering would be that of policy research. As most of you know, a large percentage of our budget currently is going into balance-of-payments assistance. We are looking at sector assistance, particularly in the agriculture sector. We are getting ourselves in positions where we are talking about trading an awful lot of budgetary resources, balance-of-payments assistance, in exchange for policy reform.

One of the things that concerns us is the tendency to negotiate this on an annual basis against some preconceived ideas about what should be done in terms of price reforms and such, and it becomes very much a question of competition of wills in some cases.

We would like to look to the issue of how we could build a dialogue over a longer period of time, and most particularly what we could do to build the analytical capacity within the African institutions themselves to start identifying what the real policy issues are and particularly what the solutions are -- this was referred to earlier this afternoon.

We would like to talk about how we would build that capacity, and how we would leave within the institutions, the capacity for the Africans to begin to work on their politicians and try to support some of the people within the governments who do want to make these changes, and see if we can start more of an evolutionary process in a better analytic capacity.

It is something we have not done a very good job of in the Agency. It is something I think we re going to have to do if we are going to follow on beyond the general discussion that we have had about policy dialogues.

I would be more than happy to have another session two months from now or three months from now on that general topic, following up on Dr. Mellor's comments today.

Dr. Hutchinson: This is one of the roles we hope to play with the Agency to be more helpful. This is the kind of response we like to hear.

Chairman York: If we proceed in that direction, Dr. Mellor I hope we could call on you and your organization for assistance.

Dr. Mellor: Yes.

Chairman York: Let me thank our colleagues from the Africa Bureau for their willingness to bring before us their strategies and subject them to this sort of scrutiny. It has been very helpful and very educational, and we appreciate your efforts. We stand ready to continue to be of any assistance we can.