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Uma Lele cochairs the inter-institutional Task Force on Research Innovations for Productivity and Sustainability. The Task Force recently released its report, Global Research on the Environmental and Agricultural Nexus: A Proposal for Collaborative Research Among U.S. Universities, CGIAR Centers, and Developing Country Institutions. She is on leave from the University of Florida where she is graduate research professor in the Department of Food and Resource Economics and was director of the Office of International Studies and Programs from 1991–93. Lele has served as member of the Board of CGIAR's Center for International Forestry Research and the Technical Advisory Committee. She was employed by the World Bank from 1971–91, currently serves as an advisor to the World Bank on environmentally sustainable development, and has collaborated with numerous international institutions. She served as President Carter's director of the Global Development Initiative in 1993–94 and was recently given the prestigious designation of distinguished scientist by the American Association of Agricultural Scientists of Indian origin.



An interview with Uma Lele on the GREAN Initiative

by Robert D. Emerson

You have recently been collaborating on a major research proposal called the GREAN initiative. Could you briefly characterize this initiative?

The GREAN initiative is an effort to build strong linkages between U.S. science generally, U.S. land grant universities in particular, the Consultative Group on International Agricultural Research (CGIAR) centers, and the national agricultural research systems (NARS) of developing countries. It has arisen as a result of two or three concerns in development. One is the deepening gap between rapidly advancing basic sciences, and the science

that is being practiced in developing countries. There is also a concern that U.S. universities, which once played a major role in bringing state-of-the-art science to developing countries, enhancing productivity growth, have now diminished their involvement in international research so much that one needs to make efforts to rebuild those relationships. A research concern, very much at the heart of the first two, is that population will increase from the most recent estimate of 5.6 billion to about 8 billion in the next quarter-century, with 95 percent of that growth likely to occur in developing countries. Food production needs to increase

very rapidly just to keep pace with population growth, not to mention the growth in income. Unless there are dramatic new means of bringing about collaborations on a much larger scale than have existed in the last decade or so, the problems of food insecurity and resource degradation in developing countries will be considerable.

How would you characterize global poverty and food security as we enter a new millennium?

We know now that there are over a billion people in the developing world who already live on less than a dollar a day. Over 60 percent of that population is concentrated in Asia and Africa. We also know that the majority of the population growth is going to occur in parts of the world where there is already a substantial incidence of poverty, and it is going to occur particularly among households who are the poorest in the world. So, unless something is done to rapidly increase productivity growth, many of these households already living on the edge of poverty will be moving into marginal lands, causing resource degradation much beyond what al-

“Developing countries as a group have now surpassed industrial countries as the major importers of agricultural commodities from the U.S.”

ready exists, also causing a considerable amount of environmental damage because of the deforestation that will occur, leading to global warming. We know that the poverty problem is no longer a problem contained in the borders of the developing world alone; it is going to have substantial effects on the industrial world, among other things, because the migration will not only be to marginal areas but also to the urban centers in developing countries and, in turn, to the industrial world, causing considerable domestic policy pressure in industrial countries, including the United States.

How have the successes of the first Green Revolution in the 1960s affected U.S. agriculture, agricultural producers, and U.S. citizens?

It is an interesting question because there was concern that increasing production in developing countries would mean that U.S. markets would be lost.

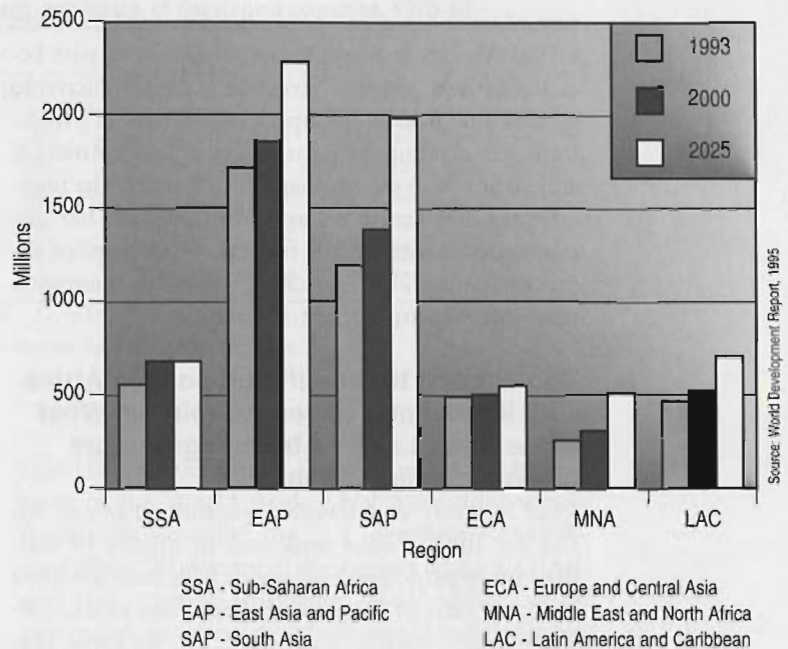


Figure 1. Population, actual and projected, by region, 1993-2025

Quite paradoxically, countries that have been the most successful in achieving rapid growth in agricultural productivity are also now the major trading partners of the U.S. and, particularly, are major importers of U.S. agricultural commodities. Developing countries as a group have now surpassed industrial countries as the major importers of agricultural commodities from the U.S. Since 1986, simply the growth in agricultural trade is estimated to have created a quarter of a million U.S. jobs. As countries develop their agriculture and create more employment and income, the demand for food expands, and, as their incomes increase further, there is diversification of diet by shifting from cereals to high-value crops. Demand for animal feed, edible oils, and fruits and vegetables—all commodities in which the U.S. has a strong comparative advantage—increases.

In contrast to Asia and Latin America, Africa's farmers and consumers did not appear to participate in the first Green Revolution to a large extent. Why do you think this was, and how can progress be made in African agriculture?

A large part of the area where the Green Revolution occurred in Asia is irrigated. Productivity growth has bypassed semi-arid areas of Asia just as much as it has bypassed Africa. Unfortunately, because African agriculture is almost exclusively dependent on low and uncertain rainfall as compared to parts of Asia, it has not benefited from increasing production. Total irrigated land in Africa is only about 12.6 million hectares, while it stands at 163 million hectares in Asia. So it is partly the na-

ture of technology and partly the nature of resources of the African continent. But it is also in part because African policies have not been conducive to agricultural growth. Comparative analyses of protection and taxation in parts of Asia, Latin America, and Africa have shown that Africa has had the highest rates of taxation on agriculture, which has discriminated against small farmers, both in price incentives as well as in lack of adequate interest in rural infrastructure, research, extension, etc.

You alluded to the difficult soils in Africa with limited and uncertain rainfall. What is the potential for African agriculture given these limitations?

That is a very controversial question. Parts of Africa are much better endowed in quality of soils than other parts, and high yields have been achieved in many parts of Kenya and Zimbabwe in tea, coffee, tobacco, cotton, and maize. So, we know that there are parts of Africa in which it is possible to increase productivity as much as it is in any other part of the world. At the same time, population densities in a lot of marginal areas have been increasing rapidly because of a particularly high rate of population growth in Africa. Therefore, although the returns to research in agriculture in marginal

areas may be low, often people ask what would be the cost of not dealing with problems of low-productivity agriculture if this population, for instance, migrated to urban areas and one had to create the infrastructure to generate livelihoods for these people. The costs per unit of employment created in the urban sector may well be substantially higher than creating employment in the agricultural sector. Another contention is that much of the research focus has been on food security (cereals and root crops) in marginal areas rather than on high-value crops, such as cotton, tobacco, tree crops, fruits, and vegetables. It is quite possible that some high-value crops may have much higher rates of return to research in some marginal areas. I come from a state in India, for example, that produces wine and has very high rates of return to investment in research on grapes, but that is not something in which the CGIAR has invested in the past.

Turning to South Asia, there were significant benefits from the first Green Revolution, yet you point out that the poor in South Asia are more numerous today than in any other area of the world. Does this not pose a very pessimistic view of the potential for agricultural research in alleviating poverty?

No, because the poor in South Asia would have been even more numerous if there had not been investment in the Green Revolution. Unless something is done about investment in population policies simultaneously with investment in advanced education and health improvements which improve the quality rather than the quantity of children, the food population dynamics will always remain unfavorable to the food situation. One obviously needs to simultaneously work on population policies as well. But even under the most optimistic scenarios, population will increase to 8-9 billion; the question is how can this population be fed. If it is to be fed, then one is going to have to invest more in research.

Figure 2a. Share of population in the developing regions, 1985

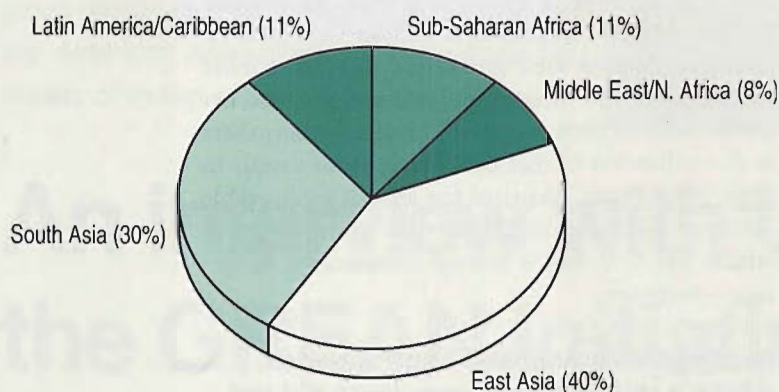
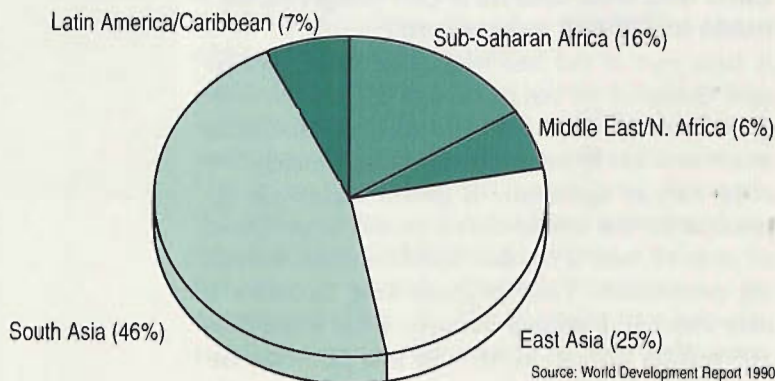


Figure 2b. Share of poverty in the developing regions, 1985



Source: World Development Report 1990

The GREAN initiative emphasizes increasing agricultural productivity. Will not further agricultural development lead to more serious environmental degradation?

I think that the focal point of the GREAN initiative is to increase agricultural productivity in a sustainable way. Experience from the first Green Revolution in areas where productivity growth has occurred has resulted in some very serious problems of waterlogging, salinity, high use of fertilizers and pesticides, etc. The past ways of increasing productivity are no longer sustainable, even in the areas where productivity growth has occurred. One of

Table 1. Percent area planted to modern varieties of rice, wheat, and maize, in developing countries, 1970-90

	Rice ^a			Wheat ^a				Maize
	1970	1983	1991	1970	1977	1983	1990	1990
Sub-Saharan Africa	4	15	na	5	22	32	52	43
West Asia/N. Africa	0	11	na	5	18	31	42	53
Asia (excl. China)	12	48	67	42	69	79	88	45
China	77	95	100	na	na	na	70	90
Latin America	4	28	58	11	24	68	82	46
All developing countries	30	59	74	20 ^b	41 ^b	59 ^b	70	57

Source: D. Byerlee, *Modern Varieties, Productivity and Sustainability*, CIMMYT, Mexico, 1994.

^a Excludes tall varieties released since 1965; if these varieties are included, the area under Mvs increases, especially for rice in Latin America.

^b Excludes China.

the challenges is to increase productivity while using the minimum of additional resources. That is what makes the use of science far more urgent.

Could you elaborate on the significance of gender issues for agricultural and economic development?

Well, we know that 50 percent of the farmers around the world are women, at least, but especially among the poorer households; we also know that female-headed households are disproportionately represented in poor households. We also know that they have very little access to new technology. Not only do they not receive the technology that is generally available, but there is very little consultation with women as to the nature of the problems that they face. We also know from evidence of studies that women in poor households of developing countries work much longer hours than do men. There are quite a large number of simple technologies which can be developed to reduce the burden on poor women so they can devote more time to improving the health and nutrition of children which will reduce fertility rates. So there is no question that, if the long-term interest is in improving the quality of life, the focus of research and extension should be very strongly on helping poor women increase productivity.

The U.S. scientific community has tremendous capacity in agriculture and the environment. It might be argued that we should focus all of the activities encompassed under the GREAN initiative on the U.S. research community and simply communicate those results to interested parties in developing countries. Yet the GREAN initiative identifies the CGIAR centers and the NARS as key participants in the effort. Why are these groups so important to the program?

The CGIAR is an important institutional innovation fostered by U.S. private foundations and

USAID after the Green Revolution under the auspices of the World Bank. Over forty donors now contribute annually; the U.S. generously contributed about 20 percent of the budget of the CGIAR, and that enabled leveraging of an additional 80 percent of the resources which would otherwise not have been available. U.S. contributions have now declined sharply to about 10 percent or less. But international funds have enabled the creation of sixteen institutions around the world now doing strategic research with the potential for very large spillover effects. Because production conditions tend to be highly diverse, technology generated in one part of the world is not easily and directly transferable to other parts of the world, particularly in rain-fed agriculture. The CGIAR centers and research institutions in developing countries have taken parental lines of improved germ plasm and methods of generating new technology to developing countries and created technology much more appropriate to their circumstances. So the role of the NARS and the CGIAR centers is extremely important if the objective is to have a massive effect on the world food problem. Also, due to its limited presence in the Third World, the U.S. no longer has the convening power that the international institutions such as the CGIAR have to bring together a large number of partners to address major problems. That is the reason why one thinks of U.S. universities as working in partnership with the CGIAR centers in developing countries.

Is the more active role of the U.S. scientific research community in the universities likely to deplete resources going toward domestic research?

In a rapidly globalizing economy where U.S. markets are expanding rapidly, it is important to understand what is going on in other parts of the world. One effective means by which the U.S. can benefit domestically, for example, is through access to germ plasm; the CGIAR centers have the largest collection of germ plasm in the world. My recol-

lection is that 60 percent of the wheat planted in the U.S. has genetic material coming from the CGIAR. Another example of the value of these collaborations is in containing diseases and pests which come to the U.S. borders. There is a tre-

“...even under the most optimistic scenarios, population will increase to 8–9 billion; the question is how can this population be fed. If it is to be fed, then one is going to have to invest more in research.”

mendous cost of waiting until they arrive rather than being actively involved in research where they may have originated.

The GREAN initiative will provide research to help develop international agriculture. Yet the U.S. has one of the most productive agricultures in the world. Would it not be more efficient to simply unleash U.S. agriculture’s comparative advantage to feed the rest of the world?

There are several people who make that argument, and I think it is possible only if import capacity of developing countries is increased. The most important consideration is that if developing countries are to import American goods and services, they must export in order to have the import capacity. In fact, as I pointed out earlier, countries with very high rates of agricultural growth are also the major importers of U.S. commodities.

How can we reconcile offering research assistance to solve the problems of global agriculture when public research funding for the U.S. is and has been dramatically falling in favor of privately funded research? Can we not also rely on the private sector to provide the necessary research for global agriculture?

Private sector research in developing countries actually has been growing considerably, particularly the application of research. But it is only in situations where intellectual property rights are protected, where there are obvious opportunities for making profit. However, the majority of problems that we referred to earlier—problems related to management of natural resources, problems related to alleviating poverty among the

poorest of the poor—are not necessarily the problems where there are immediate profit opportunities. Even in the U.S., which has a very impressive and large research capacity with annual research expenditures of about \$6 billion, one-third of that research is done in the public sector. That public sector research has paid off in the very long term and would not have been carried out by the private sector because its benefits could not be captured through business profits. The same argument is much stronger in the case of developing countries.

The current U.S. political environment gives rather harsh scrutiny to international assistance projects. How can it be argued that this proposed effort is in our national interest when we have so many domestic concerns such as funding adequate education, infrastructure, health care, federal budget concerns, and many more?

It is difficult in this budget-cutting environment to think about problems that are going to haunt us later if something is not done now. Close to one-half a billion dollars was spent by the U.S. in Rwanda and Burundi to deal with the political and ethnic problems there. In part, the lack of development and the competition for resources creates social and political tension, resulting in such conflicts to which the U.S. sends either military aid or humanitarian aid of substantial proportions. One wonders what would have happened if the \$500 million had been used to create new technologies to build a strong economy in those parts of the world so that there would not be such conflicts. There are already over 100 conflicts ongoing in the world that we do not hear much about in spite of the fact that they also need some attention. I should add that at a time when there is substantial interest in maintaining competitiveness of U.S. agriculture, and when there is also a likelihood of declining subsidies to agriculture, the need to invest in education to create greater understanding of the world market by American students and faculty is just as important as the science and technology that would be imparted to developing countries. Our task force members have felt strongly that we should stress the need for \$100 million annually at full maturity of the program. In today’s resource-constrained climate that seems like a lot. However, considering the magnitude of the problems to be addressed, the relative size of the benefits to the U.S., and that the current U.S. agricultural research system spends about \$6 billion annually—of which about \$2 billion are public funds—\$100 million is not such a vast sum.

What is the current status of the GREAN initiative and what will be required to bring the effort to fruition?

We are pleased that the GREAN initiative has received a positive response from the USDA and USAID as an innovation and idea for establishing new, more innovative linkages with developing countries. We believe it is a more appropriate response in the post-Cold War situation rather than the old-style, paternalistic foreign aid programs. We are hoping that, as the federal budget debate evolves, eventually the GREAN initiative will be funded, but we recognize that resources to the tune of \$100 million, which have been our dream, hope, and ambition, will not be easy to raise. It will take at least three to five years for perhaps even a full-blown pilot program to materialize. So, in the interim we are looking to both U.S. public funding and private foundations to support the GREAN initiative on a small scale to operationalize it on a pilot basis, to improve its design, and to experiment with it, so that the full public funding is used much more effectively as and when it becomes available. The demand for the program in developing countries is enormous. We already have strong expressions of interest from Brazil, the southern cone countries, India, China, and several African countries. We are trying to create a market for scientific services by developing programs which are demanded by developing countries and involve competition among universities in which at least part of the resources for collaboration are paid by developing countries out of their own resources, including through World Bank loans/credits and other assistance programs. These are new ideas and will take time to be accepted among universities, CGIAR centers, and developing countries. We have a coalition of twenty major land grant universities and the en-

dorsement of a number of major professional scientific associations, including the AAEEA, willing to work with us, moving along GREAN, and creating the political support in the U.S. that it deserves.

I have one final question. Assuming that the program was implemented, how would you characterize a success story of the GREAN initiative?

We have said that the GREAN initiative needs to generate a large number of second-generation mini Green Revolutions throughout the world. They will not be as dramatic as the first Green Revolution because they would be much smaller, much more location-specific, and much more difficult to design. But the way to characterize the success of the GREAN initiative would be to establish that incomes of poor people in the developing world had increased to a point where they are in a position to sustainably exercise demand in the marketplace, leading to further expansion of U.S. trade with developing countries. An additional measure of success would be the renewed commitment of U.S. universities to international work. **■**

■ For more information

The report that describes the GREAN project is available from R. Hunt Davis, Jr., Coordinator, Global Research on the Environmental and Agricultural Research Nexus Initiative, Office of International Studies and Programs, University of Florida, 123 Tigert Hall, P.O. Box 113225, Gainesville, Florida 32611-3225. The GREAN report is also available on the World Wide Web at the following URL: <http://www.cals.cornell.edu/OfficeResearch/GREAN/GREAN.html>

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