Public and Private Roles in Agricultural Development
Proceedings of the Twelfth Agricultural Sector Symposium

Jock R. Anderson and Cornelis de Haan, editors

Report No.: 11505  Type: (PUB)
Title: PUBLIC AND PRIVATE ROLES IN AG
Author: ANDERSON, JOCK R.
Ext.: 0  Room: Dept.: BOOKSTORE  DECEMBER 1992
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The World Bank
Washington, D.C.
FOREWORD

The tradition of the Annual Agricultural Symposium is now well established. It is an exciting time of the year for many reasons -- not the least being that it is the occasion when the maximum number of World Bank agricultural staff have the opportunity of getting together and considering matters of substance and novelty.

This year the Symposium was an especially interesting occasion since it was the first opportunity for many Bank staff to meet the new President, Mr. Lewis Preston, who honored us by opening the Symposium.

Our deliberations got off to a spirited start with the Opening Address of Mr. Mahbub ul Haq, formerly of the World Bank and of many senior positions in Pakistan and, most recently, of UNDP. His address "The Myth of Friendly Markets" led to a vigorous debate with participation by many of the very large audience of Bank staff.

The theme of this year's Symposium -- Public and Private Roles in Agricultural Development -- is one that is to the fore of debate on many aspects of Bank operations. The Symposium was thus a very appropriate time to canvas issues concerning the proper balance between public and private roles in the many facets of agricultural development. Most of the deliberations of the Symposium were linked to this general theme and the contributions ranged across roles in marketing, credit, research, extension, input supply, seeds, veterinary services, and grassroots development initiatives.

The topics covered went beyond just issues of public versus private balance. The occasion was taken to update Bank staff on matters related to the natural resource base underpinning agriculture -- a theme explored in even greater depth in this year's World Development Report -- as well as contemporary developments in fields as diverse as biotechnology, human nutrition, and aquaculture.

In making these papers available in this Proceedings form, it is our intention to share the assembled materials with those within the Bank who did not have the opportunity of participating, and those outside the Bank who share our concerns for more effective engagement in the agricultural development process.

Michel Petit
Director
Agriculture and Rural Development Department
# TABLE OF CONTENTS

**Opening Session**

Opening Statement  
Lewis Preston  
3

The Myth of the Friendly Markets  
Mahbub ul Haq  
5

**Governments and the Handling of Purchased Inputs and Marketed Outputs**

The Art of Privatizing after Decades of Central Planning  
Robert L. Rcs  
15

How to Privatize a Parastatal  
Wilfred Candler  
21

Rural Finance in Developing Countries  
Jacob Yaron  
31

**New Approaches to Supporting Agricultural Research and Extension**

An Initiative Involving the Private Sector in Meat and Livestock Research  
Nigel H. Monteith  
47

The United Kingdom Experience in the Privatization of Extension  
Paul Ingram  
51

**Agricultural Delivery Systems**

From Agricultural Extension to Rural Information Management  
Willem Zijp  
61

Energizing the Communication Component in Extension: A Case for New Pilot Projects  
Bella Mody  
81
New Technologies in Soil Fertility
Maintenance Private Sector Contributions

Dennis H. Parish 97

Public and Private Sector Roles
in the Supply of Veterinary Services

Cornelis de Haan and Dina L. Umali 125

Fostering a Fledgling Seed Industry

Alexander Grobman 139

The Development and Marketing of New Material
from Biotechnology in the Commercial Sector

Sue Sundstrom 143

Long-Term Issues Affecting the Environment in
Which Public and Private Roles Are Played Out

The Global Supply of Agricultural Land

Pierre Crosson 155

Land Use Planning and
Productive Capacity Assessment

Wim Sombroek 171

Update on Aquaculture:
Small-Scale Freshwater Fish Culture in South Asia

Darrell L. Deppert 181

Nutritional Considerations in World Bank
Lending for Economic Adjustment

Harold Alderman 199

Nongovernmental Organizations

Private Voluntary Initiatives:
Enhancing the Public Sector's Capacity to
Respond to Nongovernmental Organization Needs

Anthony Bebbington and John Farrington 223

Nongovernmental Organization Alternatives
and Fresh Initiatives in Extension:
The Aga Khan Rural Support Programme Experience

Shoaib Sultan Khan 249

Closing Session

Closing Remarks

Michel Petit 265
OPENING SESSION
OPENING STATEMENT

Lewis Preston*

The year ahead promises to be exciting and challenging. After the extraordinary events of the last few years, one hesitates to predict in January what will happen in February, but we do have a vague outline of what we can expect in 1992. We will see real benefits in developing countries from General Agreement on Tariffs and Trade (GATT) negotiations. We will see a further reduction in the debt of low- and middle-income countries, as well as cuts in military spending by both industrial and developing countries. Progress in these areas will free up resources for development. In the Bank we face a difficult round of negotiations in the International Development Association 10 (IDA-10). The demands on IDA are growing at a time when donors have many pressing obligations both internationally and domestically. We must make every effort to secure resources for development by demonstrating that we offer the most effective channel for developmental assistance. If we are able in real terms to at least maintain the level of the IDA-9, we should all be pleased.

I want to briefly mention the Global Environment Facility (GEF), a reflection of the Bank’s stewardship that we must execute with our customary expertise. The international community turned to the Bank to find a mechanism to address a problem, and in a remarkably short time the GEF was established in cooperation with the United Nations Development Programme (UNDP) and the United Nations Environment Programme (UNEP) and with the backing of a diverse group of developing countries. We are already well into the 3-year Pilot Phase of the main program, and a second smaller program was recently launched for the Brazilian rain forest.

In terms of our organization, the most difficult problem is going to arise with the former Soviet Union, particularly in relation to our human resources. The G-7 and others will back membership for the former republics. The International Monetary Fund (IMF) will probably expedite its process, as has been done in the Bank, where we will try to address the problems of the newly independent states. The Bank is enormously well positioned to carry out its study of food sector policy and agricultural reform in the former Soviet Union, and Russell Cheetham, department director for the former Soviet republics, has positioned us in exactly the right spot. It is important that this be a cooperative effort, with other development agencies and the European Commission playing an important role. Real difficulties, however, lie ahead. The opportunity presented by the liberalization of consumer prices in the Russian Republic is significant. By allowing the market to work, we will perhaps have avoided the most difficult situation possible because it is unlikely that either the financial resources or indeed the transportation system within the former Soviet Union would be large enough to handle the grain supplies and food supplies needed not just this year but next. And so it is a vital assignment, and I hope that we can succeed. It also, of course, entails great risk, but it is better to have tried than not to have tried.

* Lewis Preston is president of the World Bank.
We have had an enormous bit of luck. Perhaps it was the wisdom of Mr. Gaidar (Acting Prime Minister) because the teams that were chosen on the Soviet side were chosen on a regional rather than republic basis. The recent political events, therefore, did not affect how the teams were functioning. The regions chosen were Moscow, Kiev, Sochi, and Alma-Ata. The Bank's team was led by D. Gail Johnson of the University of Chicago. Despite the political turmoil, the teams have been able to continue to function. I hope we will have a report that produces a reasonable chance of improving the 1993 spring crop.

The problems we are going to have in dealing with twelve separate republics are immense, and we will have to staff ourselves appropriately. We do not have an enormous amount of Russian-speaking talent assembled in this institution, though we are going to need it. The human resource problem is something that our current members are sensitive to, and we are going to have to handle it carefully. In terms of financial resources, however, the former Soviet republics are unlikely to be a significant drain on resource flows to our traditional borrowers for a long period.

We have tried to speed up decisionmaking in our own organization, and we have created an Office of the President, which will deal more directly with the regions and with Lawrence Summers (DECVP) and Visvanathan Rajagopalan (OSPVP). We also have initiated a process to recentralize the human resource and personnel function.

Additionally, we are changing our budget process to make it more useful. Clear budgets and better planning are essential, and we can streamline the exercise down to about three months instead of thirteen, making it a more effective procedure in the Bank.

Finally, one facet of the Bank pleases me enormously, and that is the institutional concern about quality. This is the key to whether we are going to be regarded as the best and most progressive development bank in the world.
KEYNOTE ADDRESS

THE MYTH OF THE FRIENDLY MARKETS

Mahbub ul Haq*

I return to these halls after a decade, with a feeling of great nostalgia. For 12 long years, I sat in these offices, I roamed around in these confusing corridors. I may have lost my way at times—only physically, I hope, not intellectually—but I must say that I left the Bank with a tremendous regard for this institution: for its enormous talent, for its intellectual ferment, for its great contribution to development debates. My own contribution to this institution will always remain somewhat debatable, despite the very gracious words of our chairman, Visvanathan Rajagopalan. But those were certainly very impressionable years that I spent here and I learned a lot. One of the essential lessons I learned in the Bank was that it is dissent, not conformity, that keeps an institution alive. I speak to you today in a very candid spirit, as a friend and as a former colleague. Honesty is a gift only friends can give.

We are certainly living through very exciting times. The development pendulum is beginning to swing once again, from an overcommitment to the public sector to an overenthusiasm for the private sector. There is a "garage sale" of public enterprises going on all over the world—from New Delhi to Rio, and from Warsaw to Moscow—enough to warm the heart of any ideologue of capitalism. We also see professional shock therapists roaming all over the globe in search of willing victims, delivering the message of overnight change. Certainly the long overdue return to the market has started in many developing countries and I welcome it. But my fear is that the pendulum may swing once again too far and we may all live to regret it. I hope that at least this development institution puts this issue of public and private sector role in its right perspective. In this context, let me pay a tribute to the World Development Report 1991. I read it not as a defence of the markets: I read it as an attempt to put the markets in their correct perspective, because the conclusion of the report was that "it is not a question of either state or markets: each has a large and irreplaceable role."

But before I come to the markets and what I call "the myth of the friendly markets," let me go back a little as to why an overcommitment was made to the public sector in many developing countries. Were we so ill-informed that we did not know what we were doing? I think, at that time, all of us, as we grew up during our formative years, faced the challenge of tremendous poverty in our societies. We realized that great disparity existed between various income groups and that we needed to pursue a range of social objectives, not only higher economic growth, to liberate our societies from poverty. In this search for social objectives, many developing countries lost their way. There was an innocent flirtation with socialism but unfortunately there was a mix up between ends and means. The means that were chosen were a large role for the public sector and, instead of a pursuit of the real social objectives, often it became bureaucratic capitalism. The economy was handed on a silver platter

*Mahbub ul Haq is Special Advisor to the Administrator of the United Nations Development Programme. This is an edited transcript of an address given extempore at the World Bank’s Twelfth Agriculture Sector Symposium on January 8, 1992.
to the civil servants, often ill-trained and ill-paid. Many times they used controls and regulations, not to enrich the economy but to enrich themselves.

A very strange world emerged in the past 30 years. We had public enterprises in agriculture, industry, trade—all productive sectors—many of them inefficient and losing money. In Cameroon, for instance, the annual losses in the public sector enterprises exceeded the total oil revenue of the country. In the Philippines, these losses were 2 to 3 percent of the gross national product (GNP) and, but for these losses, the country could have increased its education and health spending by about 30 percent. In Sri Lanka, two-thirds of the budget deficit is explained by public sector enterprise losses. In Argentina, public enterprise losses exceed 11 percent of the GNP. These countries were short of financial resources. Yet they wasted their scarce financial resources, and even more scarce management skills, on inefficient public enterprises that could have been privatized with great benefit to all sides. As such, there was a strange "Alice in Wonderland" situation in many parts of the developing world. They committed their scarce resources and energies to things that the private sector could have done more efficiently and they did not then have enough resources left in their budgets to do the things that only the government could have done, particularly provision of social services and investment in education and health. Then they all complained about poverty of resources. As I look at these budgets, and I have handled budgets in my country, it was not the poverty of resources, it was the lack of political will. This is especially true when one considers military spending levels in these developing nations, which often exceeded their spending on education and health. Restructuring the priorities of many of these budgets would have really given them the resources they needed for urgent human development.

But after saying all this, let me confess to you today that I am very worried about the new ideology of the markets that is emerging globally. In many of these countries, markets are neither free, nor efficient, nor equitable. Unless there is a good regulatory role of the state, and unless free markets are combined with social compassion, we may have a good deal of upheavals coming in many of these countries.

Now let me focus on one major point. Markets are not very friendly to the poor, to the weak, to the vulnerable, either nationally or internationally. Often we act as if markets are free. They are not. I have seen that in my country. The markets are often the handmaiden of powerful interest groups, and they are greatly affected by the prevailing distribution of income. If it is an income ratio of twenty-six between the top 20 percent of the population relative to the bottom 20 percent, as it is in Brazil, the market allocates resources to the rich. In fact, Brazil spends 12 percent of its GNP on social services. But the main beneficiaries are higher income groups. About 88 percent of its public sector health budget is spent on expensive urban hospitals for a few rather than on primary health care for all. Brazil gives eighteen times more subsidy to university students than to primary education while only 1 percent of the enrollment in its universities comes from the bottom 20 percent of the income group. That is why Brazil has four times the child mortality of Jamaica, despite having twice the per capita income of Jamaica and despite spending more on social services. This dramatically illustrates how even the distribution of public services is skewed in favor of the rich, not just the allocation of resources in the market, if the initial distribution of income and assets is extremely unequal in a society. Markets cannot become neutral or competitive in such a situation unless the playing ground is made more even and playable to begin with.
I think that one particular question is very vital to understand the role of the markets. Is everybody in a position to compete in the market or are some people going to fall outside the marketplace because they do not have enough education, health, and nutrition to compete on any footing, let alone equal footing? That is why I believe that a much better distribution of income and assets, of credit, of power structures, and certainly a better distribution of knowledge and skills is vital to make markets work more efficiently.

Now you may not often be able to distribute income and assets more equitably. There are many practical problems, there are several political limits. But you can distribute knowledge and skills quite equally in many countries and that is a tremendous leveling force to enable people to compete in the market. That is why I strongly believe that unless there is a tremendous investment in human capital formation in many of these countries, the markets will continue to work inefficiently and inequitably, and may be hijacked by the rich.

This is also true of global markets. The next Human Development Report that we are producing on behalf of the United Nations Development Programme (UNDP) is focusing on whether global expansion trickles down to poor nations and poor people. Global markets are unfortunately not particularly friendly to poor nations or poor people. Just think for a while about some of the dramatic conclusions that this report highlights about the global markets:

- Developing countries are being denied at least US$500 billion of economic opportunities in the global markets every year because of trade restrictions, immigration controls, and uneven capital flows. This is about ten times the amount of annual foreign assistance they receive.
- The poorest 20 percent of the world’s population receives only 0.2 percent of global commercial credits, 1 percent of world trade, and 2.7 percent of global foreign private investment.
- The indebted nations of Latin America paid four times higher real interest rates in the 1980s compared to the industrial countries (17 percent compared with 4 percent) because of the major fall in their commodity prices.
- Capital markets worked in such a fashion in the 1980s that the poor nations started transferring US$50 billion a year of net resources to the rich nations every year by the end of the decade.
- Commodity markets worked in such a way that primary commodity prices (excluding oil) declined to their lowest levels since the great depression and Sub-Saharan Africa alone lost more than US$50 billion in export earnings between 1986 and 1990 because of depressed commodity prices.
- Sub-Saharan Africa’s share in global trade markets declined from 3.8 percent in 1970 to 1.0 percent in 1989, despite many trade concessions.
- The real income disparity between the top 20 percent and the bottom 20 percent of the world’s population exploded to 150 times by 1990--more than twice the level of 1960--as a natural working of the global markets.
The basic point is that markets do not automatically favor the poor, the weak, the vulnerable. Unless some policy steps are taken to enable the poor to compete on an equal footing, they may stand to lose a great deal from the workings of the unregulated market system. So our first step must be to accept the logic of the marketplace but then to turn around and make these markets work more efficiently in the interests of all the people. What we need are people-friendly markets. After all, markets are only a means: people are the end.

If we wish to establish people-friendly markets, which are accessible to all the people, which encourage full participation in the mainstream of economic life, which extend their potential benefits to everyone rather than to a privileged few, then some preconditions must be met. There should be a more equitable distribution of income, productive assets (particularly land), and credit. There must be sufficient human investment to enable people to compete on an equal footing. There must be no barriers to market entry--religious, ethnic, gender, or any other barriers. There must be competitive market conditions and regulations for monopolistic practices so as to prevent the powerful few from bending the markets to serve their own narrow interests. There must be a regulatory role of the state to ensure that external diseconomies are not created for the entire society in the pursuit of private greed and that those who create such external "bads" (such as environmental pollution) are made to pay for the privilege. In other words, people-friendly markets require a very activist role of the government, not to overregulate economic enterprises but to create conditions of more equitable access to competitive markets.

Even when markets are fully competitive, it is inevitable that some people will fall outside the market place and require a social safety net. Because the preconditions for people-friendly markets are often missing in many economic and political systems, particularly in the developing countries, the need for such a social safety net often increases. Every society develops a certain social consensus over time as to how to balance market efficiency and social compassion. In the United States, the New Deal was an historic watershed when the American Society articulated a new social consensus between markets and government action -- a social contract that is still there despite some recent weakening. Even today, the United States transfers about 10 to 15 percent of its national income to the more vulnerable groups in society through medicare, food stamps, unemployment benefits, and other social security programs. In Nordic countries, this ratio is above 30 percent. In many developing countries, less than 5 percent of their national income is often spent on such social safety nets, while the need for social programs is much greater in these societies than in industrial countries because their income and asset distribution is generally worse, their markets are generally less competitive, their barriers to market entry are generally more formidable, and their systems of democratic accountability are generally less institutionalized. And yet many international consultants and financial institutions have the courage to advise these developing countries to dismantle even their existing meager social safety nets in the pursuit of market growth. Obviously, they feel that there are no political limits to change in these poor lands while they would cringe at suggesting a fraction of similar structural adjustment in their own richer societies.

And that is why we are witnessing a new era of professional shock therapists. They often emerge from the inner sanctums of Harvard and Yale, with their academic innocence still intact, and they carry the message of instant change to many far-off lands whose cultures and political systems they least understand. Let me quote you a few passages about shock therapy from an article by Mr. Conrad, former Deputy Prime Minister of Czechoslovakia, which appeared in the New York Times on January 5, 1992. He says that, unfortunately, the doctrine of shock therapy is out of touch with reality and it ignores the impact of such an approach on the worst-educated skill classes of Eastern
Europe. In Czechoslovakia, where radical reforms have been in place for a year, the outcome in 1991 was a 22 percent falloff in industrial output, an increase in unemployment from 2.5 to 8.5 percent, an inflation rate of 5 percent, a 33 percent decline in domestic demand, and a 40 percent shrinkage in the gross domestic product. Mr. Conrad admits that all of these trends are obviously the consequences of 40 years of communist mismanagement but he contends that their sudden intensity results from shock therapy. And he notes, very pertinently, that it took Margaret Thatcher 12 years to privatize Britian whereas Eastern Europe gets only 2 years. He concludes with the sad observation that shock therapies are untested beyond the economic laboratories of Cambridge, Massachusetts.

Let us review the dismal record of shock therapy. It has not succeeded in many societies. The human and social costs of change have been unacceptable and have often led to political upheavals.

Take China for instance. It experienced an unprecedented rate of GNP growth of 8 to 10 percent a year in the 1980s. Economic output went up at a fantastic pace throughout the decade. But what happened to social progress? During the same period, many social indicators began to weaken. Life expectancy went down, particularly for females. Health indicators deteriorated because, with the disappearance of the communes, there also disappeared the nationwide system of primary health care nurtured by barefoot doctors. Income distribution deteriorated; unemployment and inflation emerged in a society with no prior experience of these phenomena. People did not begin to share the fruits of market productivity before they began to witness the human distress in freer markets, with a weakening of the social safety nets, which used to be taken for granted in these societies. Many people asked the legitimate question: why is there a weakening of the social indicators when the society is experiencing a higher income growth? Some of these questionings, to my mind, led to the confrontations in the Tiananmen Square. And I do believe that the Chinese policymakers are right in graduating the pace of change and watching more carefully how economic and social progress are balanced.

Take the example of Sri Lanka. It was regarded as a model of human development for a long time but is beset with ethnic conflicts recently. What really changed in society? Sri Lanka has been experiencing a high level of literacy and life expectancy for many years, with Tamils and Sinhalese living together for many decades. In 1979, an adjustment package formulated by the International Monetary Fund (IMF) directed that the free rice rations given to every family be modified and targeted more narrowly (and more efficiently it was suggested) on the very poor through a scheme of food stamps. The scheme made it easier for civil servants to hijack the free nutrition poor families were previously getting. By trying to focus the food stamps only on the poor, Sri Lanka only succeeded in excluding many poor families from the scheme. There is sufficient evidence that nutritional levels of the poor declined significantly in the 1980s. This at a time when average per capita income growth had accelerated. The consequent upheavals should have come as no surprise. I know the reality of so-called ethnic troubles. I have seen them in my own country. They ultimately represent social and economic grievances that simply boil over. And what is then the response of the state? Sri Lanka ended up spending more on its police and its security than it was previously spending on food subsidies. What a cruel choice for a finance minister—he has to opt to put bullets in the stomachs of his people rather than food, even when the bullets cost more. And all because the IMF was monitoring expenditure on food subsidies but not expenditure on police and security. And how unnecessary, because higher income growth should have permitted higher, not lower, social spending.
The basic point, which many professional shock therapists forget, is that the opening of market mechanisms need not inflict unacceptable social and human costs on the people. Their challenge is to design strategies that can combine rapid change with the minimum possible human costs. It is no use shrugging away the social pain with the banal observation that pain is inevitable in a major transition to the markets. Maybe so, but the most critical question is the distribution of pain: is it borne only by the masses or also by the privileged economic groups in societies? My own perception is that much of the pain for the poor people can be avoided if the burden of adjustment is placed on the favored strata of society—military establishments, industrial tax evaders, the feudal rentier class, corrupt civil servants, and higher income groups. The international institutions should calculate the distribution of the pain of adjustment in a society and try to protect the poor within the society, rather than nonchalantly walk away from the issue. How lightly the issue of more equitable distribution of pain was treated by outside consultants and institutions can be illustrated by just one example: their criminal silence on military spending levels in the developing countries in the last three decades.

During the last three decades, military expenditures in developing countries increased by 7.5 percent a year, three times as fast as in the industrial countries. Military spending in the developing world rose from 7 percent of global military expenditures in 1960 to 18 percent in 1985. There are eight times more soldiers than physicians in these countries today. Many poor countries are spending two to three times more on their military establishments than on the education and health of their children. We have a situation today where military generals go around in air-conditioned jeeps while small children sit in windowless school rooms and suffocate. And yet never in these three decades did the level of military spending become a question of aid conditionality. There was more tolerance for military subsidies than food subsidies. International institutions carried out no serious economic analysis of military spending levels in the developing countries. No attempt was made to collect data on military debts—a frightening omission. No information was made available on military assistance. No international screams went up against powerful military establishments in the developing countries. Sometimes those who pride themselves on designing "rational" aid conditionality for the poor nations should pause and think whether their machoism extends only to beating up on the poor or also to standing up to powerful vested interests.

Let me not drift away from the main subject, however. The basic point is that it is possible to combine the painful transition to the market with social safety nets for the poor if some of the irrational spending priorities are changed in the system. The advocates of shock therapy should first look for some decent solutions, which can combine gradual reform with acceptable social pain, fairly equitably distributed.

Let me add as an aside that I sometimes design many tortures for these professional therapists—when it is late in the evening and I am out of any creative ideas. My favorite torture for the alumni of Cambridge, Massachusetts, is to oblige them to go to their own Senators to persuade them to pass just a 10 percent increase in gas prices (which they defeated last year) before proposing a 500 percent increase to many far-off lands. A second-best solution would be to make them the Finance Minister of Pakistan for a week—a sure cure for many firmly held theoretical convictions, as I know from my personal experience. A milder form of torture would be to make them reread their Mark Twain who said, "one's sense of idealism is in direct proportion to one's distance from the scene."
Let me conclude. I sincerely believe that opening up of the markets is the best thing that has happened to the developing countries and to the former socialist bloc. But I also believe that this transition to the markets must be accompanied by a regulatory role of the state to make the markets accessible to all people and a compassionate role of the community to extend social safety nets to the victims of the market place. This is a time to strike a balance, not to go to any excesses.

Some analysts have contended that the recent years have seen the demise of socialism and the triumph of capitalism. Let me add this thought. If this is the demise of socialism, let us hope it is not the demise of all social objectives. And if this is the triumph of capitalism, let us hope that it is not the triumph of only private greed. We have come to a new crossroads in history when individual initiative must be combined with social objectives. It is not one or the other: it is both. And the future course of our societies may well depend on how skilfully we combine market efficiency with social compassion.
GOVERNMENTS AND THE HANDLING OF PURCHASED INPUTS AND MARKETED OUTPUTS
Privatization of state enterprises had become commonplace in developing countries long before communism's demise and much experience has been accumulated. Much of this experience has been acquired in Latin America where the role of the state and of parastatal enterprises had dominated economic policies in many countries following World War II. However, few Latin American countries ever formally abandoned the structure of a market economy. Only Cuba created a completely centrally planned economy. Nicaragua is probably the country whose conditions most closely parallel those of Central and Eastern Europe and its reforms are less than 2 years old.

The Nicaraguan economy under the Sandinistas was totally controlled by the central government, but most of the economy remained legally in private hands. The Chamorro government began the process of privatizing state enterprises shortly after taking power in April 1990. Since then, some seventy-five state enterprises were privatized or returned to their former owners, and another twenty-five were liquidated. The Nicaraguan approach was to handle each case separately and no attempt at a massive privatization was made.

Each state enterprise was treated as a unique case. Although workers at these enterprises generally supported the principle of privatization, they argued that the enterprises should be turned over to them for free. The government resisted this and agreed to sell the workers up to 25 percent of the shares. The government financed the purchase at a low interest rate and attached a percentage of workers’ salaries to assure repayment.

Agriculture was treated differently. The government gave state-owned land to demobilized soldiers and contras as part of the peace process. Once land titles were granted, the new farmers have gradually been forming small farming enterprises or cooperatives.

Some land was sold to peasant organizations, some was sold to agricultural technicians on credit and, where feasible, land was returned to former owners. In all cases, the government required the new owners to farm the land under threat of reexpropriation.

Agroindustries were sometimes sold on credit to their suppliers. One state-owned slaughterhouse was sold to a large number of small cattlemen. A grain feed mill was sold to a group of sorghum farmers.

Although the government negotiators had reservations about the managerial capability of small farmers to manage an agroindustrial enterprise, they found it counterproductive to raise the issue and proceeded with the sale without making any provisions for professional management. The negotiators hope that competitive pressures from other agroindustries will eventually promote efficient management.

In order to facilitate the sale, the government negotiators undertook to clean house as much as possible. Unnecessary labor was let go and indemnified. A title search was undertaken to assure that no former owners had any claim to the land and a credit check was made to ascertain any outstanding

* Robert L. Ross represents the Latin American Agribusiness Development Corporation.
unrecorded debts. At the time of the final sale, the government issued a legal title and financial certificate protecting the buyer against unrecorded liabilities.

In general, the privatization process in Nicaragua seems to be progressing well with a minimum of red tape on a case-by-case basis. It took place simultaneously with new legislation undoing the Sandinista legislation and favoring market forces. It was done with great political sensitivity because of the effective power that the Sandinista retain as a not-very-loyal opposition. Nicaragua has proven to be most adept at developing the art of privatization.

Prerequisites for a Successful Privatization Program

First of all a consensus must exist in the population on the long-term benefits of privatization and to accept the sacrifices necessary to reform the economy. Without such a consensus, the reform process will not sustain itself, particularly in a democratic environment. Privatization will produce winners and losers, and the latter will use their political clout to protect their interests. Periodic elections will give the losers a chance to strengthen their position and slow the privatization process (witness Poland).

Second general laws must be passed and enforced that make clear the rights of private property and in general spell out the rules of the game to the economic players. Foremost among these rules are those covering competition, fiscal and tax policy, the operation of the banking industry, foreign trade and, most important of all, the functioning and independence of the judicial system.

Third specific laws must be passed and rules approved covering the scope of the privatization program and the method of carrying it out. This is the area I would like to focus on.

Privatization Programs

The rhetoric of privatization has long since outstripped reality. The euphoria of communism’s demise brought brave public statements from the new democratic leaders about creating market economies and merging with the European Economic Community (EEC). Since then, much has been done to liberalize the economy, to limit the role of the state, and to encourage private entrepreneurship. However, privatization itself has proven to be the most difficult area to come to grips with.

There are a number of issues facing government policymakers. The first of these is the timing of the reforms. For example, should privatization be pushed before free markets and the necessary legislation are well established? There is, after all, little domestic capital to purchase state enterprises, there is no store of unemployed capable managers waiting on the sidelines, and the old Nomenclatura retains influence. Hungary, which started the move toward decentralization over 20 years ago, is still in no hurry to privatize. Romania is moving systematically toward a free market economy, but is also in no hurry to privatize.
As long as the countries continue to create conditions favoring a market economy where the price system and consumer demand encourage more efficient resources allocation, an argument can be made that privatization should be delayed.

**The Wholesale Approach**

If the political decision is taken to privatize, the next question is whether the state enterprises should be sold off *en masse*, such as through public auction, or to tailor make each sale, enterprise by enterprise.

Few people would argue against the wholesale treatment of small service establishments like retail stores and personal service businesses. They are too small and too numerous for individual treatment. Invariably, assets are sold rather than the enterprise. Public auction such as has taken place in Czechoslovakia is a suitable vehicle to accomplish this.

The issue becomes more controversial as the size and complexity of the business grows. So far all of the privatizations undertaken have been tailormade, usually involving a joint venture with, or a buyout by, a foreign corporation which contributed capital, technology, management, and markets to the deal. General Electric, General Motors, Volkswagen, Cargill, Gerber, and other household names have privatized state enterprises in three Central European countries. This process will continue for some years, but will not affect more than a small fraction of all state enterprises slated for privatization.

Wholesale privatization schemes are being debated in Czechoslovakia, Poland, and Romania, all of them involving the distribution of vouchers to the general public that can be converted into shares of states’ enterprises or mutual funds acting on a fiduciary basis. It appears that Poland and Romania are favoring the formation of mutual funds run by professional management, while Czechoslovakia favors direct investment in individual enterprises. Agriculture is excluded from this plan, although many agribusiness enterprises are included. These plans call for the transfer of about 30 percent of the shares of the participating state enterprises.

The advantage of the mutual fund proposal rests entirely on the efficiency of the hired managers. It is expected that foreign investment houses will play a major role in their management. However, these wholesale approaches do not provide any new capital for the privatized enterprises, no new technology, no new management, and no new marketing skills. For these funds to become profitable, they will have to restructure and reorganize their investment portfolios one company at a time. In that sense, even the wholesale approach will have to face realities one enterprise at a time.

There are no precedents for this approach to privatization. Proponents of this strategy argue that the issue must be forced while there is still political support for privatization and that this will stimulate private entrepreneurship. The first argument is probably valid, because the public’s support for fundamental economic reforms can be expected to decline in inverse relationship to the pain they cause. The second is wishful thinking. Financial analysts and portfolio managers do not breed entrepreneurs; they hire auditors and consultants.

The Czechoslovak approach provides for the sale of vouchers at a nominal price to its citizens who will then be allowed to bid on shares of specific enterprises. It is not yet clear how all of the mechanics of valuation will be worked out, but the intent is to permit direct investment by the citizenry. This is an attractive political solution, but I do not see how it will improve the efficiency of Czechoslovak enterprise. They will receive no capital, technology, management, or market access from the program. It should accelerate the creation of a stock market, but with no liquidity to support
a secondary market, I suspect the new investors will see the value of their investments decline as people try to cash in their holdings.

The wholesale approach to privatization, in my opinion, does not address the basic weakness of the inefficiencies of the state enterprises. It does represent a major step forward in removing the state from business activities. Political realities may well force governments into bold steps that present high risks down the road, but these steps may be far preferable to doing nothing.

The Case-by-Case Approach

The most successful approach so far has been the individual sale of state enterprises to foreign corporate investors, but this only solves a few cases.

Attempts have been made to return businesses to their former owners. This approach has worked fairly well in Nicaragua, but the Sandinistas were only in power there for a decade. Most of the former owners are still around and anxious to go back into business. Two generations have gone by in Central Europe and nearly four generations in Eastern Europe.

Indeed one issue that has slowed the privatization process dramatically has been the rights of former property owners expropriated under the Communists. Most of the owners have passed away and any surviving rights have accrued to their heirs. Many beneficiaries live abroad. Some had cooperated with the Nazis. Some belong to ethnic minorities. Some had signed documents legally transferring their property to the state (or, as was often the case, to a cooperative). Some titles had disappeared as had some property registries. Memories of events did not always coincide with documents. Most of the properties had been improved since expropriation and the question arose as to who would pay for any improvements. Property claims are typically emotional as beneficiaries seek to right a perceived wrong two generations ago. Some claimants of agricultural land can show family ownership going back over 400 years.

The rights of former property owners are usually treated more on the ground of civil rights rather than economic efficiency. In the case of Romania, the government there, with little prior study, granted property rights of up to 3 hectares to each member or worker in the collective and state farms. Those rights extend to both prior ownership as well as to entirely new property rights. In some cases, individuals, fed up with the cooperatives, simply reclaimed their land on their own initiative. The entire process has created considerable confusion as to property rights and this is a major reason why agricultural production has declined in Romania since the revolution.

Another reason for the decline in food production has been a lack of credit, capital, technical, and marketing assistance for the new small farmers. This closely parallels the experience of agrarian reform in Latin America, where the real goal was to destroy the power of the large landholders. The new small farmers received inadequate assistance and production declined.

My own observation of Romanian farms is that many seemed to be well managed from a production point-of-view, but that their marketing needed strengthening. Many of them were integrated into industrial processing. By focusing its attention on broad ownership, the government runs the risk of breaking up efficient units. An argument could be made that the marketing of agricultural products should have been privatized and improved before redistributing land in the case of Romania. Political pressures forced the issue perhaps prematurely. The country is in no position to provide credit to a new class of small farmers and in even less of a position to provide technical and marketing assistance. For the new structure to work will require an entirely new system of services to
small farmers. Some observers hope that the Romanian small farmers will eventually evolve like their Western European counterparts into voluntary cooperatives.

In the case of Lithuania, privatization of farm land began with little or no legal framework, but with the tacit approval of a new independence-minded government. Cooperatives have begun to spin off plots of land to selected members, presumably with some understanding that ownership will follow when political realities permit. Sometimes other assets of the cooperatives would end up on the farm that had been spun off. Nationality considerations played a role in determining who benefited from this arrangement. It is not at all clear how the new small farmers will obtain credit, or market their production, but they are organized and can count on a sympathetic government. The assumption here is that the new farmers will make up in sweat equity what they lack in experience. Again from personal observation, the Lithuanian cooperatives appeared less focused on the products than their Romanian counterparts and also less efficient. Perhaps the new arrangement will improve production through hard work, but it will also narrow the options of restructuring the cooperatives as productive enterprises.

The Russians, without any planning and out of economic necessity, have embarked on a novel course. With few laws and almost no privatization, productive enterprises are banding together in a myriad of commodity exchanges, which are really barter houses. While they certainly lack sophistication, nevertheless, they are effectively privatizing the distribution channels. Many of these exchanges will probably transform themselves into wholesale houses or private traders. This transformation should simplify the process of privatization when it starts.

The Art of Privatization

From the above discussion, it should be clear that the art of privatization is balancing off the conflicting demands of political reality and compromise with those of the marketplace. It is not possible to debate the most appropriate road to privatizing state enterprises without first coming to grips with politics. The issues at stake are fundamental to any society; there are no major winners and losers and expectations are high. The specific realities will vary from one country to the next: it is the rights of former property owners (all of the countries); the need to pacify the country (Nicaragua); nationality issues (Romania and Lithuania); a desire to force movement in the face of a recalcitrant legislature (Poland); rearguard operations by the Nomenclatura (Hungary and Romania); and pressure to spread ownership among the population (Czechoslovakia, Poland, and Romania) among others.

The art of privatizing agriculture is a further battle of pushing reform, of partially recognizing the rights of former land owners, and of maintaining production levels. Considering the effect of pending reform on production in the Soviet Union, the Central European countries (except for Romania) have been relatively successful at keeping farm production going and even increasing (Poland).

If there is one concern I have in agriculture, it is that political pressures will force governments to turn over land for whatever reason in small parcels to a large number of small farmers. Unless they subsequently regroup as companies or voluntary cooperatives, there is a risk of creating a class of minifundio farmers who will be too small to utilize new agricultural technology and who will demand government support through high prices or subsidies to remain competitive, much as has happened in the European community.
HOW TO PRIVATIZE A PARASTATAL

Wilfred Candler*  

Introduction

When Jock Anderson asked me to talk on this topic at the Agricultural Symposium, I leapt at the opportunity, because I think it is one of the areas where better theory waits on more practical experience. I am aware that there are many members of the audience who will have had more extensive and more recent field experience than me. Nevertheless, I am pleased to be able to contribute to a Bank discussion of this topic, in the confident expectation that we will return to it often in the future. I know I am not saying the first word on this topic and I am confident that I am not saying the last. My own exposure to marketing parastatals and boards has involved four principle phases. The first was as a graduate student, particularly stimulated by Bauer and Paish's (1952) article in the Economic Journal, second as a lecturer in Australia and Professor in New Zealand. These countries have some of the more efficient and long-lived marketing boards, nevertheless this experience is well summarized by a colleague's remark after a particularly unproductive discussion of dairy marketing implications of the United Kingdom's entry into the European Economic Community (EEC) "you know what really gets to you is their self-satisfied incompetence." Third as a Bank project officer dealing with parastatals particularly in Tanzania, but tangentially in Zambia and Egypt. Finally in the Operations Evaluation Department (OED) I have contributed to studies of the Bank's experience with Price Policy Conditionality and Agricultural Marketing, which involved a fairly extensive review of relevant projects worldwide. Interestingly, one of the recommendations from these reviews was that the Bank ought to provide for an annual participatory seminar in which field staff, their immediate managers, and research staff could review their experiences, as to some extent we are doing today.

I have laid out my experience, because this determines the perspective with which I approach the problem of privatization. It also warns that I have no direct experience of these problems in Asia, Latin America, Eastern Europe, or indeed in Francophone Africa. However, properly interpreted, I believe my perspective may be of interest to staff in these areas, if only because of the contrast between Anglophone Africa and these other regions, and because of some generalizations which flow from the examination of a large number of projects.

Problem Setting

The African parastatals with which I worked were either inherited from the colonial administration (Namboard in Zambia) or created after independence as an extension of the public administration.

* Wilfred Candler is Chief of Party for the USAID funded Environmental and Natural Resources Policy and Training Project.
sector patronage system (National Milling and the export and import parastatals in Tanzania). As different from Eastern Europe in particular, there was no conviction on the part of the government or parastatal management that there was any need for structural change. Rather the government’s view was that there were no inherent problems with the parastatal system that could not be fixed by sufficient injections of concessional aid. Another key feature was that despite the best efforts of government there was a nascent private or informal sector, often prohibited from operating efficiently by specific legislation. The profit motive was alive and well, though shackled.

Another key feature was that in large measure the Bank and the bureaucrats were talking past each other, as indeed were Programs and Projects within the Bank. For the Bank staff there were drastic problems of economic inefficiency, for the bureaucrats there was no problem because “I’m getting mine off the top.” Illustrative economic problems included no private interregional shipment of food grains, all agricultural inputs imported through a single parastatal, and cotton unginned (and farmers unpaid) because of lack of spares and cash. It was the government monopoly on interregional grain shipments (together with access to food donated to meet the resulting shortages), which assured the bureaucrats of their preferential access to food, the monopoly on imported inputs offered scope for side-payments, and at least for government officials there was no clear “down side” to cotton remaining unginned. Indeed, the worse the ginning problem, the better the cotton authorities prospects for getting privileged access to foreign exchange, or authorization for overtime and special incentives.

Thus a key feature of this experience was the need to (a) convince skeptical officials of the existence of a problem, and (b) to in fact impose a solution. I say impose because even having lost the "intellectual" debate as to the existence of a problem, the officials concerned would rather live with it, because it suited them personally, than solve it. There were clear parallels with Koestler’s novel "Darkness at Noon," because the rules of the game were that one could only proceed to implement a solution after the existence of a problem had been admitted. To proceed directly to the solution would have been to be "doctrinaire," an unpardonable sin.

A Typology

The above already suggests a typology of privatization problems. Is there official conviction that change is necessary? Is there a nascent private sector which can be permitted to compete with the parastatal? To which we might add: Are there economies of scale or other factors that imply a natural monopoly? Is there a need for public agencies to ensure against market failures, or to increase the efficiency of the competitive solution? Is there consensus on the problem and solution in the Bank?

As suggested my own experience comes from situations where (a) government saw no need for change, (b) a nascent private sector existed, (c) there were no economies of scale, (d) it was possible that government could play a constructive role in limiting the price fluctuations that might occur within a competitive market, and (e) in at least one case there was no consensus within the Bank on the remedy to be sought.

In contrast many current privatization problems in Eastern Europe involve (a) governments convinced of the need for change, (b) no nascent private sector currently existing to compete directly with the parastatal, (c) the technology used may well have created economies of scale, and (d) consequently there may be a need to regulate the company once privatized. For staff grappling with the latter class of problems, this paper will primarily be of interest for the contrasts it points to.
Why Privatize?

As will be discussed, the inefficiencies associated with monopolistic parastatals were readily demonstrable in the cases where I have direct experience. However, the major benefit expected from the changes sought was an increase in competition. We were fairly agnostic about the fate of the parastatal per se, though one could hypothesize that it was likely to downsize, perhaps to zero. In such an event the "privatization" would be achieved by new private firms replacing the parastatal, rather than in a change in the ownership of the parastatal.

As a casual reader of the Economist, my picture of Eastern European parastatals is of an organization unresponsive to price signals (whose selling prices probably bear no relation to any estimate of costs, or of demand elasticities), subject to what Kornai has described as a "soft" budget constraint, and using a technology that is simultaneously capital, labor, raw material, and pollution intensive. The question then is: Which of these characteristics will be changed by privatization?

The soft budget constraint, which allows the parastatal to have access to subsidies and unsecured bank credit is, of course, directly connected to the noted, insensitivity to prices. The soft budget constraint arises because faced with closing the plant or allowing it to "borrow" to stay open, governments feel obliged to authorize the credit which, in turn, takes the pressure off management to make needed changes. In Africa, when a parastatal reports that the cotton or maize crop will have to go uncollected because it is short of "working capital," the government, and indeed Bank economists, have little choice but to recommend further financial accommodation in the short run. A short-run problem that can reappear annually. The existence of competitors in this case means that the budget constraint can be imposed, because a competitor will collect the crop.

If the only effect of privatization is to impose a hard budget constraint (no access to extra credit, even if this implies bankruptcy for the organization), then there is some question as to why this cannot be achieved without privatization (though, privatization should not be expected to actually be counterproductive). Imposition of a hard budget can be expected to result in very substantial changes in the firms operations. This could include downsizing, closing some facilities, and extensive layoffs, if it does not actually lead to bankruptcy. This introduces a problem of "the transition" from soft to hard budget, which is distinct from the situation where private firms can be allowed to expand and progressively steal market share from a declining parastatal.

If, on the other hand, privatization is also expected to involve substantial improvements in plant and physical facilities, then this requires an injection of capital and probably know-how. Which in turn may require foreign investment in the absence of convertible currency and local private capital to inject. There is also a question as to what, if any, policy changes are needed to ensure a more competitive environment for privatized firms. It may also turn out that other macroeconomic conditions inhibit efficient operation even by a privatized firm; the phenomenon of multiple constraints.

Two Examples

The two examples I will use to discuss the process of replacing a monopoly parastatal by a competitive environment involve a food parastatal and input supply. In the former case all maize, rice, wheat, sorghum, millet, and cassava had to be sold to the National Food Authority (NFA),
which was responsible for providing food to the populace. The NFA's purchase and selling prices were fixed annually by government and were pan-territorial and pan-temporal, that is say the same prices applied countrywide and for a full year.

In the case of input supply, all imports of agricultural inputs had to be made through a few parastatal importers. Fertilizer and raw materials were the responsibility of the Fertilizer Company, but other than that all agricultural inputs had to be imported through the Agricultural Import Company (AIC). This policy was known as "confinement," because the relevant imports were confined to one company. Even where a company had been an agent for an overseas supplier (say Lister Engines) for decades, the new law required that only the AIC could import the product.

Strategy

The basic Bank strategy in dealing with the parastatals was not to privatize them directly but rather to expose them to competition on a "level playing field," and to impose a hard budget constraint. This finessed the issue of how or whether to privatize them or how to "plan" for their demise. The strategy was, of course, only possible given the existence of a private informal sector, and a pool of African entrepreneurial talent. The private sector was held back by multiple binding constraints. The strategy was to remove these constraints as the opportunity arose. It was a bit like freeing Gulliver, cutting an individual string would not necessarily free him, but with enough of them cut, he would be able to get up. A master plan for the simultaneous removal of all constraints would only have been possible if there had been genuine government commitment to the demise of the parastatals, and if all the relevant constraints were known ex ante. One of the results of relaxing a constraint, say ability to move grain between regions, was to reveal another constraint, say the lack of access to foreign exchange by private millers to buy spares.

An interesting point is that the inefficiencies of the official parastatal system were so huge that anyone competing with it effectively was bound to make huge profits, at least initially. Thus once able to compete, the private sector would be self capitalizing. We met a fellow in Mwanza who would take the ferry to Geita (a short trip which took all day) three times a week and bring back three sacks of rice, which he would transport in a wheelbarrow to the market and sell the next day. His income was greater than the National Milling Company's manager in Mwanza who had a staff of hundreds, and responsibility for hundreds of tons of grain.

I do not wish to give the impression that I think this is the only case. Clearly there are cases where there is a natural monopoly either because of economies of scale, or the need to carry out certain functions at the national level. Even where there are many primary processing plants, as with tea, coffee, or cotton, there may be a need to organize a single national auction, to arrange for the product to be inspected by potential buyers, to promote a national trademark, or limit sales to quota markets, and so on. A marketing system that pays the producer directly (with or without a quality premium) will perform quite differently to one where the producer receives his actual realizations, less marketing board and processing charges. Especially if each processing plant (or groups of them if there are central services such as maintenance that can be shared) is incorporated separately, so that processing and marketing efficiency is directly reflected in the payout to suppliers, we can expect producer pressure to improve processing efficiency. Farmers should be able to compare payout from neighboring plants, and thus query why less remunerative plants cannot improve their practices. Where there is a natural monopoly by virtue of economies of scale in processing, an element of
competition can be retained by requiring the processor to offer a custom service, whereby he charges for the service provided rather than buying all the raw material before processing it on his own account. The point is that there may be several ways to introduce competitive elements into the structure of an industry.

A frequent motivation for government intervention in the food market is to avoid being at the mercy of "private grain speculators." Governments often wish to control the supply of basic foods. It is not generally productive to challenge such ideas head-on. Rather one can show how little intervention is needed to prevent excessive price variability, and hence (excessive) speculative profits. In the case of food there is often a strong desire by governments to set the price, and to assure "food security." Even with a large bureaucratic parastatal this typically proves beyond the governments capacity. Rather the parastatal provides food to a select portion of the population (the Party, public servants, and expatriates as a municipal market manager described it succinctly), whereas the balance of the population, including the truly poor, provide for themselves on an unofficial market, at higher prices.

Although the present paper tends to emphasize getting government to stop doing things that it should not do, we should not overlook that it has a comparative advantage in several areas, especially setting quality standards, market reporting, provision of marketing infrastructure (especially municipal markets), roads, enforcement of contracts, and so on.

Theoretical Discussion

The rather obvious disadvantages of these institutional arrangements came to the Bank’s attention in the context of a proposed project and normal sector work. The initial discussions with government were essentially theoretical, and it has to be admitted that, in my view at least, the government got the better of the debate. It is extremely hard to argue that a market with all its known imperfections could do better than an all-wise, benign, and optimizing planner. The theoretical ability to recognize shortages instantaneously (if not anticipate them), to achieve economies of scale, particularly in bargaining with suppliers, to eliminate excess inventory, and so on, give central management of the economy and sectors of the economy a theoretical advantage that simply cannot be advanced for a market solution.

Even our skepticism that one price applied countrywide for a full year was likely to induce inefficient behavior was brushed aside by reference to the social equity of such a system. So much for the idea that well-trained technicians of goodwill can arrive at improved policies purely on the basis of theoretical discussions. Of course if both sides agree that the present system has to be replaced, there is a better chance for some agreement on the theoretical directions for change, though even in this case the fundamental disagreement, even in theory, as to what constitutes an improvement may only have been delayed. The next step was empirical investigation.

Empirical Investigation

The Bank was very wisely supporting an Agricultural Policy Group (APG) in the ministry of agriculture, which enabled us to get the performance of the two parastatals looked at locally. What
they found was far worse than our worst case theoretical discussion. In the case of food, the official system was not really reaching beyond the Party, public servants, and expatriates (why the latter should have had preferential access to cheap food is not clear, presumably it had something to do with the equity argument advanced in our theoretical discussions). The rest of the population obtained their food from the informal market, at widely divergent prices. Key to the operation of the NFA was a law limiting interregional shipment of grain to 30 kilograms a person on any one trip. The informal market was quite highly organized with some municipalities providing a central market for stall holders and even, on occasion, setting their own "price ceilings" for transactions in the municipal market, sometimes at multiples of the official price. Meanwhile the limit on private interregional shipments of grain was rigorously enforced by road blocks offering as it did the opportunity for seizing grain or the payment of substantial bribes to the enforcing authority. The result was local grain prices at multiples of the official price in deficit regions, and at fractions of the official price in surplus regions, in the event that the NFA was unable to buy (due to a shortage of cash or trucks, not foreseen in the theoretical discussion). The result was interregional price differentials of up to fivefold. This information was not obtained "for free." Rather Bank staff suggested to the APG that they should set up a price reporting system for the informal market. This took some time to establish, but eventually they organized ministry staff in the larger towns to visit the municipal market weekly and send a postcard to the APG giving price ranges and availability of the main grains. In due course, we had the bizarre situation of the newspaper and radio regularly carrying the APG's price report, although officially the informal market could not exist, because all grain sales were to be made to the NFA!

The situation for agricultural inputs was, if anything, worse. There was a fundamental problem that any export earnings from the agricultural sector were treated as "free foreign exchange" available for allocation as the Reserve Bank thought fit, with the result that the country always found itself short of the foreign exchange to buy the imported inputs needed to produce the next export crop. Again the APG was persuaded to include an examination of the import intensity of agricultural exports in the work program. It was found that for exports per se, 25 percent of export income was needed to finance imported inputs. If the import needs of the agricultural sector as a whole were to be provided for, then 50 percent of agricultural export income would need to be reserved. There was simply no priority system for assuring the availability of the necessary foreign exchange, and hence the inputs. Each year a hit-and-miss process of donors and the Reserve Bank trying to provide the country's requirements on a predictable crisis basis took place.

Where money was available, the AIC's role turned out to be entirely counterproductive. Examination of a large order of mixed spares showed that the cost, with all add-ons added on, of the order from AIC was just twice what it would have been for the agent dealing directly with his principle. Although this was not, for the most part, a loss of foreign exchange, it raised the production costs very substantially for mechanized farmers, most of whom were indigenous. Worse still, spares, which could be imported in three months or on an emergency basis in 10 days by air, were taking years to be delivered, with machinery idled for years in the process. Cost was added by the AIC, but not value.

These stories are told, not for the details of the stories themselves but to illustrate that (a) the real life inefficiencies stemming from poor policies can be far, far worse than the worst that could be hypothesized, and (b) that relatively modest empirical investigation can document these costs. These stories also illustrate the wisdom of the Bank supporting an indigenous analytical capacity. It is not just that such a capacity is likely to be highly cost-effective compared to the Bank obtaining the same information on the basis of sector work. Some important data requires routine collection, so that a one-off enquiry simply cannot give the desired results, and analysis done in-house always has more credibility (and has a built-in lobby for attention).
I am always surprised and rewarded by talking to farmers and entrepreneurs as to the accuracy of their understanding of their problems, their causes, and the direct way they can illustrate and document them. Firsthand discussion with the people expected to be involved in any new industry structure is, in my experience, an essential step in the formulation of improved proposals.

**Negotiations**

In negotiations, I find it useful, and surprisingly easy, to depict myself as gullible in the extreme. Willing to believe any story, and equally willing to convey it to my bosses. My bosses on the other hand I depict, perhaps slightly less honestly, as paragons of intellectual rigor. This allows me to distinguish between the arguments that I would accept (practically anything) and the deceptions that would pass muster with my bosses, (practically nothing). It is also very important to have a firm understanding of the motivations leading to current economic policies. It was evident in the case of food policy that there was a paranoid fear of government being subject to extortion by private speculators who might have cornered the country’s stocks of grain. A genuine political motivation for the confinement of agricultural inputs was less evident, beyond a possible desire to undermine the existing private sector and cooperative distribution organizations, and a naive faith in planning of all kinds.

Having established by the empirical investigations the existence of a problem, the question to be negotiated becomes, how do we propose to justify new Bank lending? In the case of grain distribution, a problem had been clearly revealed by the price reporting of the APG, including the occurrence of surplus grain producing regions where producer prices fell below the controlled price, and the existence of other regions where the NFA was unable to meet all demands at the official retail price. This was accepted by government policymakers as a "real" problem. They agreed with the objective of "increasing the efficiency of the distribution system" and had to admit that forcing empty trucks to run from areas of grain surplus to deficit areas was not efficient.

Given the basic reluctance of the government to make changes, the semantics of this discussion were crucial. Had we talked about the "rights of the private truckers," or the "magic of the market" the government officials eyes would have glazed over, or worse still we would have returned to a theoretical argument, where we had not fared too well. Stating the problems in terms of demonstrable physical inefficiency, allowed us to reach some agreement as to the nature of the problem. This allowed us to suggest that although we could recommend that off-farm stocks would remain in the public sector ("no private speculation in grain" in the political vernacular), we could not see our management accepting the idea that trucks would not be allowed to carry a load of grain when running from surplus to deficit regions. This resulted in an agreement in principle to (a) allow individuals to move 300 kilograms (rather than 30 kilograms) of grain between regions, and (b) to license traders to ship grain interregionally. Honoring of this agreement was another question, but we managed to come to an apparent meeting of minds on the nature of a solution. This apparent meeting of the minds was no doubt facilitated by the existence of an International Development Association (IDA) credit for US$40 million to the NFA that had been suspended pending resolution of issues of institutional reorganization.

The outcome for agricultural inputs was much more problematic. On reflection, I believe a major problem was that we never achieved consensus within the Bank as to the seriousness of the problem, let alone with the government. This was before the reorganization, when disagreements
between Programs and Projects could only be resolved at the Vice Presidential level, and in the circumstances it should be no surprise if a basic difference in approach persisted. On the Projects side we believed, I think rightly, that unless agricultural inputs equivalent to about one-half the value of agricultural exports were used for inputs (including those needed for food production) then agricultural output was bound to decline. Programs had, so far as I could tell, a different approach, which asked the question: What can the government afford to allocate for agricultural inputs? Taking account of other requirements, defense, embassies, and so on, they came out at a much lower figure. It should perhaps be no surprise that this issue was never adequately argued between Programs and Projects, because in its pure form the Programs position was indefensible.

Put more charitably the Programs position was that if x percent of agricultural export income was reserved for imports, then Bank projects and other donor contributions could probably be counted on to come up with the balance. The Projects position came close to the same, because it allowed that any donor-financed agricultural inputs should release an equivalent amount of foreign exchange to the country’s free foreign exchange.

In any event, the Bank did agree to provide a credit of US$50 million to fund "emergency agricultural inputs" in response to an undertaking by government to reserve US$50 million of agricultural export income for importation of inputs. We went into the negotiations with legal documents specifying that in future years the government would retain 25 percent of agricultural export earnings, but were informed unilaterally by Programs during the negotiations that 15 percent would be sufficient. With hindsight, it is evident that Projects should have refused to endorse a project based on this lower figure. What had been conceived as a "pump-priming" project became a simple band-aid operation. The deconfinement of agricultural inputs was not explicitly addressed in this project, the expectation being that foreign exchange for importation would be made available to the agent needing it, thus bypassing the AIC. A later agricultural project attempted to tackle deconfinement head-on.

Again, the purpose of this detail is not the specifics of this particular situation, but rather to illustrate that effective policy reform has to be agreed both within the Bank, and between the Bank and the borrower.

Outcomes

As indicated the outcome of the food marketing reforms was much more satisfactory than for imported inputs. In addition to the opening of food markets to competition, the credit provided for a maximum overdraft by the NFA that this said nothing about the relation of producer and consumer prices per se, but it did imply that in the long run either they would be on a cost recovery basis, or the NFA would receive an explicit "on budget" subsidy. It imposed a hard budget and any "off-budget" subsidy financed by an increasing indebtedness to the (parastatal) banking system was ruled out. Ministerial announcements were made that outlawed road barriers, and these were very largely effective. The limit on personal shipments of grain was raised by notification in the Gazette for 30 to 300 kilograms. Interregional trade in grains was very substantially liberalized. Even when (illegal) road barriers were introduced on a sporadic basis by regional authorities, they did not inhibit the personal shipments, which in aggregate had a major impact. One year after the policy change the grain price in deficit regions had halved in real terms, and was even slightly lower in monetary terms. Major restructuring of the NFA also took place.
The "Export Rehabilitation" project was much less successful. If measured against the complete collapse of the agricultural export sector, which might have taken place without the credit, then something was achieved, but the intended priority for agricultural imports was not achieved. Inexplicably the Bank continued to provide new lending to the agricultural sector, despite the government being in clear violation of even the weak conditionality which had accompanied the credit. The basis for maintained export production continued to be missing. A later agricultural project returned to the confinement issue.

There is an interesting parallel here with problems that could occur in Eastern Europe. In the above experience, there was no reason to doubt that the national government wished to have all road barriers removed, but it turned out that the national writ did not run nationwide. Some provincial authorities simply defied the central instructions in favor of raising local revenues. What should the Bank do? Withdraw the support for the national government, despite its having done its best? Or, go along with a partial implementation of the policy?

Lessons

I have drawn the following lessons from this experience.

* The necessity to be quite clear about what is expected to result from the privatization (or more generally the policy change). Before asking how to privatize, we need to ask why privatize? Is it to get a hard budget? Competition? New investment? Each may dictate a somewhat different approach.

* As a corollary to the above, the advantage of supporting an indigenous policy analysis unit, which can carry out investigations in a depth or for a time span, to which the Bank cannot aspire.

* It may be necessary to settle for a second-best solution. In the grain example, we managed to substantially free up the trade in grain, although still leaving the government with a monopoly in the off-farm storage of grain. In the inputs case we managed to establish priority for access to foreign exchange (honored in the breach), but did not manage to modify the confinement policy in this project.

* Even in the presence of an indigenous policy analysis unit, it is essential for Bank staff themselves to talk with the intended beneficiaries of privatization (more generally the policy change) because they may have experiences and expectations that no amount of abstract hypothesizing would be likely to predict.

* Where there is disagreement with the government on needed reforms, it is important to try to understand the government's perspective and motivation, because this can facilitate the choice of the best of the second-best options.
Endnotes


2. This was also the approach used in the Philippines and Turkey Agricultural Sector Adjustment Loans (Loans 2469-TU and 2585-TU).

3. A similar situation was found in the Sudan where sector work showed that far from benefiting from the low controlled price of sugar, the very poor had no access to official supplies, and had to pay several times the official price for the little they could afford to consume.

4. The Bank's concern with economic inefficiency was reinforced in this case by a Party discovery of evident corruption. An examination of the NFA's books having revealed that the sum of interregional grain shipments sent between branches of the NFA substantially exceeded the recorded receipt of such shipments.

5. Of course a first-best solution would involve an exchange rate at which it was not necessary to allocate foreign exchange.
RURAL FINANCE IN DEVELOPING COUNTRIES

Jacob Yaron*

Background

The establishment of formal agricultural credit systems in most developing countries over the recent decades was motivated by the belief that widespread shortages of short- and long-term finance constituted a constraint that arrested agricultural growth and development. The absence of what was perceived as affordable formal credit was also blamed for delaying, if not preventing, a timely adoption of new production technologies and the dissemination of nonlabor intensive inputs such as fertilizer, thereby slowing down the growth and development of the agricultural sector. The "infant industry" argument was frequently raised to support intervention in financial markets in favor of the sector as a whole or in support of specific segments of it (small-scale farmers, promotion of new technologies such as line of credit to finance shallow tube wells, and so on).

The "Second-Best" Argument

The emergence and proliferation of distorted economic policies affecting the agricultural and rural sectors provided prointerventionists with additional arguments favoring interventions by states in financial markets in order to compensate the agricultural sector for the distorted, urban-biased macro-policies (overvalued rate of exchange, price control on agricultural products, and overprotection of domestic industrial inputs that were used as agricultural inputs). Many donors initiated and supported channeling concessional credit to agricultural credit programs, based on the "second-best" argument, that is, mitigating the impact of "urban-biased" policies. Governments in developing countries have intervened heavily in rural financial markets, aiming at supplying affordable credit to small-scale farmers and rural entrepreneurs, who were perceived as a clientele with no alternative access to formal credit markets. A perceived imperfection in rural financial markets that generated a discrepancy between social and private costs and benefits has provided a justification for intervention in rural credit markets. As private returns were estimated to be below the social ones, the intervention was intended to overcome this failure and to spur investments that would not have materialized otherwise.

The perceived imperfections in rural credit markets stem from the characteristics of agricultural production systems. Agricultural income is influenced markedly by climatic conditions, which expose the rural population to higher risks than those prevailing in other sectors. In addition, crops may often be subject to drastic price changes, causing further variability in farmers' income and the related repayment capacity. These risks are typically highly correlated across wide segments of the farming community. Lending in rural areas often implies servicing a geographically dispersed

* Jacob Yaron is senior rural finance advisor in the World Bank's Agricultural and Rural Development Department.
clientele, which entails high transaction costs. In many developing countries, the weak legal system and the ineffective reinforcement arrangements have contributed to the reluctance of commercial banks to engage in lending to the rural population. Related to this issue is the frequent lack of secure land tenure, leading to the absence of collateral or reduced foreclosure capability.

When commercial lending institutions have been active in rural areas, they, in most instances, have focused on large-scale farmers while small-scale farmers have been ignored, because of the significant lending cost in processing and servicing unsecured small loans. The prevalent, though often unjustified, belief that small entrepreneurs constitute a higher risk than large ones has encouraged catering to large borrowers. In the absence of strong formal credit markets, informal credit markets have flourished in many developing countries. These informal markets are characterized by low transaction costs for the borrower and rapid disbursement of funds. These features can be attributed to close familiarity with the borrower’s creditworthiness that, combined with efficient loan collection mechanisms, made the informal credit market, often either the exclusive or the preferred source of credit in rural areas in spite of high interest charges. Most of the informal lenders, however, were limited in the term diversification of the loan portfolio, and operated within limited geographical areas.

The intervention was viewed as justified also on equity grounds—moneylenders’ short-term, high-cost financing was considered an impediment to growth and equity objectives. The social cost of intervening in financial markets was perceived to be minor. Three basic forms of intervention in the rural credit market have prevailed: (a) the administrative allocation of funds to agricultural activities and rural areas, (b) an imposed interest rate ceiling, and (c) the establishment of and regular support for specialized agricultural credit institutions (SACI) in order to cover their regular deficits. These interventions attempted to influence the amount loaned in rural areas and the price of loanable funds as well as to control the institutional development and mode of operations of the SACIs involved.

Performance

By and large, past performance of the state- and donor-supported agricultural credit operations has been below expectations. Most of the programs reached only a minority of the farming population, while benefits were frequently concentrated among wealthier farmers. Many of the institutions established or supported for delivering credit programs have not developed into self-sustaining credit facilities. Furthermore in many instances, the subsidy dependence of these institutions has become significant and has been rising. This, in turn, makes credit programs an extremely costly affair for their sponsoring governments. For example, the agricultural credit systems of the World Bank’s three most important agricultural credit borrowers in the 1980s, Brazil, Mexico, and India, have all suffered from severe equity erosion. In Brazil and Mexico, highly negative interest rates in an inflationary environment generated the erosion, while in India the equity erosion resulted from dismal loan collection (Yaron and Siegel 1988). In the agricultural credit systems of Brazil, Mexico, and India administrative interventions retarded the development of efficient financial markets and had negative implications for other sectors in the economy by depriving them of loanable funds and increasing their borrowing costs.

As an Operation Evaluation Department (OED) study of agricultural credit projects in twenty-four countries points out, these projects often have failed to become vehicles to upgrade farm technology. The programs reached a minority of the farming population and benefits were frequently concentrated among wealthier farmers. For example, a study in Costa Rica has shown that income
distribution could be significantly improved if credit subsidies were eliminated (Vogel 1984). Many of the institutions established or supported for delivering credit programs did not develop into self-sustained credit facilities.  

The disappointing performance of the credit supply-led approach can be attributed to two sets of issues: (a) some of the underlying premises of this approach were frequently not valid, and (b) the institutions and arrangements established or utilized for implementing the policy were often designed and operated in a nonviable manner, or within a policy and social environment hindering their effectiveness.

**Issues Related to Supply-Led Credit Approach**

**Perceived Shortage of Credit**

In many instances, it is not clear that rural areas are significantly constrained by a shortage of funds. Furthermore, in areas where effective interest rates are kept low through subsidies or ceilings, demand tends to exceed supply and an artificial sense of shortage of credit prevails. Recent surveys in China and Thailand indicated that both among borrowing and nonborrowing farmers (mostly smallholders), only a minority had an unsatisfied demand for formal liquidity (Feder and others 1989). Most farmers have access to the more flexible services provided by informal lenders. It is commonly claimed that informal lenders charge very high interest rates as a result of their monopoly position, and are therefore not socially desirable. This view is not necessarily warranted. For example, studies in India, Malaysia, and the Philippines show that there is a significant level of competition in informal markets and relatively little monopoly. In the Philippines, monopoly profits amounted to less than 4 percent of the total sum lent (Harris 1983; Singh 1983; Wells 1983; Technical Board of Agricultural Credit 1981). In many instances, the high rates of interest charged by informal lenders reflect primarily the high costs and risks involved in lending to small farmers, although cases of exploitation exist.

The general validity of the premise that credit shortages inhibit adoption of new technology is questionable because many inputs and technologies are divisible and can be adopted in a gradual manner, so little capital is needed initially. Poor marketing networks, input supplies, and distorted product prices are often more crucial constraints on technology adoption than lack of credit. Unless the new technology requires substantial up-front outlays, with returns spread over time, it is not obvious that credit is the best mechanism to encourage adoption of new technologies. Studies indicate that even small farmers have a significant savings potential, and are capable of mobilizing resources when profitable opportunities for investment exist. This potential justifies institution building to facilitate intermediation, but not necessarily infusion of external funds. Rather, a large inflow of external funds, especially when made available at subsidized rates, suppresses both savings and the growth of viable commercial institutions. The perceived failure of credit markets to provide funding for worthy agricultural activities can often be traced to inadequate public investment in legal and physical infrastructure, enforcement mechanisms, and commodity risk mitigating arrangements that would make lending to agriculture a more profitable undertaking.
Fungibility of money

The effectiveness of attempts to address the inadequacy of market-induced institutional credit to agriculture through government intervention is often hindered by the fungibility of money. In many instances, unless costly supervision is undertaken, borrowers can use funds for purposes preferable to them, regardless of the objectives promoted by policymakers. Furthermore, it is impossible to ensure that borrowed funds are used to finance more investment than would have taken place otherwise, with funding from other sources. Additional loan funds may thus generate only a partial increase in investment, especially if the profitability of agriculture is low and farmers have other, more attractive investment or consumption opportunities. Two OED studies on the effect of agricultural credit found that substitution of funds was a major factor responsible for the limited success of credit in enhancing productivity (OED 1980, 1976). For example, of the funds provided through Bank-supported credit projects in Mexico, Pakistan, and the Philippines, only 25 to 50 percent were estimated to have added to agricultural investment. The common argument that subsidized credit should compensate farmers for other policies, which penalize agriculture (for example, price controls, overvalued exchange rates, and commodity export taxes), is frequently not valid because the subsidy does not change the profitability of the agricultural activities adversely affected and invariably accrues largely as a windfall to the less needy beneficiaries. Even if diversion of funds is effectively controlled, the recipients of the funds are, in most instances, only a small proportion of the farming population, and thus the distortion in resource allocation is not significantly rectified.

Issues Related to Credit Delivery System

Lack of Savings Mobilization and Misguided Performance Criteria

Many specialized agricultural credit institutions have suffered from deficiencies inherent in their design. They frequently were not expected to function as true financial intermediaries that mobilize deposits to make loans. Instead these institutions have merely channeled government supplied funds to rural borrowers. The continuous availability of external funds at below-market interest rates has not obliged rural financial institutions to operate under financial viability constraints. Together with the lack of competition and limited accountability, this has led to bad loans, extremely inefficient operations, patronage, and irregularities. A report prepared for the World Bank by local experts in India states that "During the election years there is considerable propaganda from political platforms for postponement of loan recovery or pressure on the credit institutions to grant extensions to avoid or delay the enforcement process of recovery. The willful defaulters are, in general, socially and politically important people whose example others are likely to follow." Therefore, it is not surprising that arrears of about 50 percent have plagued this system. Furthermore, the above cited report observes that "the general climate in rural areas is becoming increasingly hostile to recoveries."

Because their operations were not driven by commercial financial performance criteria, lending institutions have lacked the incentives to make strong collection efforts. Rather the performance incentives of specialized agricultural credit institutions often have been based on quick loan approval and disbursement and rapid growth in the lending volume, facilitated by rapidly
expanding external funding from donors. Deficient financial reporting practices have made it difficult to determine when and which payments are overdue. Typically, data presented on arrears (when they are available at all) only allow for a partial analysis of the loan portfolio. This underestimates the severity of the arrears problem when the portfolio grows rapidly in nominal terms (high inflationary economies) and the loan portfolio consists of substantial long-term loans or grace periods are granted. Among important Bank clients, Brazil, Mexico, and Yugoslavia all used stock measures of loan arrears, despite the fact that they were all plagued by high inflation. This resulted in a misleading picture of the quality of the loan portfolio (Yaron and Siegel 1988). Proper provisions for bad debts were not made and an adequate assessment of the institution's viability was often impossible. This deficiency has been widespread, as reflected by the fact that only one-third of twenty-four Bank appraisal reports for agricultural credit projects, which were reviewed by AGR for the period 1982-88, reported on annual collection ratios and six provided no information on arrears.

As a result, financial data often present rosy scenarios while in absence of adequate provisions for loan losses, the SACIs' financial statements are likely to mislead the analyst. The overall cost of maintaining the SACI afloat is almost never presented. Many of the subsidies involved in SACIs' operations, such as concessional financial resources that were made available by the Central Bank, or state repayment of foreign exchange losses on strong currency denominated loans, are not adequately captured in the SACIs' financial statements when the issue is the overall financial cost of maintaining the SACI afloat. Deficient financial reporting has contributed to lack of clarity on the SACIs cost side. In many instances, the subsidies that benefited the SACIs were not transparent, not funded from the budget, in order to allow a public debate on their costs, benefits, and social desirability.

Specialized agricultural credit institutions, which depend almost exclusively on external funds, have to follow government directives when allocating their funds. As these directives frequently include administrative allocation of funds to certain target groups and exclusive lending for agriculture, the financial intermediaries have limited ability to diversify their loan portfolio, to use creditworthiness criteria, and to implement adequate risk management policy.

High Lending and Borrowing Costs

In their attempt to ensure eligibility and avoid diversion of funds, specialized formal institutions incur high costs and also impose high transaction costs on borrowers. Typically, farmers are obliged to spend significant amounts of both money and time to obtain loans from specialized institutions. In fact, small borrowers' transaction costs are often so high that the effective cost of a loan (including transaction costs and interest payments) obtained in the formal market exceeds that of a loan from the informal market. A study in Bangladesh, for example, has shown that the average effective cost of a loan smaller than 1,000 Takas varied between 146 percent and 169 percent in the formal market, while it varied from 57 percent to 86 percent in the informal market (Ahmed 1989). Only for loans above this amount were effective loan cost cheaper for credit from formal markets. Another study in Bolivia showed that transaction costs which borrowers had to incur before they even knew whether their loan would ever be approved amounted to over 18 percent of the amount applied for (Ladman 1984). The same costs amounted to slightly over 8 percent in the informal market. A cross-sectional study found that transaction cost as a percentage of official interest rates could be as high as 245 percent (Bangladesh) for small loans, while it was between 3 percent and 56 percent for large loans (Cuevas 1988). The high borrower transaction costs for small loans obtained from official lenders explain why small farmers who require modest loans may avoid using the formal market.
The Effect of Controls on Interest Rates

Official ceilings on onlending interest rates have frequently forced lending at rates which do not cover transaction and risk costs. For example, the typical spreads of 3 to 6 percent do not provide for full cost recovery when lenders' administrative costs for small- or medium-sized loans can reach up to 20 percent of the sum lent. Even specialized rural financial institutions with a good loan portfolio and excellent collection rates cannot cover their operating expenses with such a low spread, as shown by the example of the Malawi Development Finance Company, which collects over 97 percent of loans made, but can only cover 17 to 20 percent of operating costs (Africa Technical Department 1989). Further, it has often not been taken fully into account that high rediscount margins (whereby the central bank refinances most of the volume of subloans) allow financial intermediaries to overcome their liquidity problem while being left with the full credit risk. In the face of restricted onlending interest rates, financial intermediaries resorted to credit rationing. Hence, fewer but larger loans were made to save on administrative costs and minimize risk. This caused concentration of benefits among larger farmers in spite of the programs' equity objective (Braverman and Guasch 1989). Administratively fixed or improperly indexed interest rates caused massive erosion of rural financial institutions' equity in several highly inflationary economies, which in some cases was temporarily masked by the inflow of external funds. In Mexico, for example, loans were inefficiently indexed, so their nominal value increased by only slightly more than one-half the enormous inflation rate between 1980-87. In Brazil, improper indexation resulted in a subsidy of US $5 billion within a 6-month period in 1986 (OED 1989).

Loan Collection Performance

Borrowers' incentives to repay loans are limited if it is known that no serious efforts will be made to collect the dues and that default will not affect access to future loans. Government leniency on delinquencies has frequently encouraged new defaults. These factors, when combined with official lenders' inadequate incentives to collect loan repayments, led to low recovery rates in many official credit projects. Collection rates have usually varied between 50 and 80 percent, but sometimes have even fallen below 20 percent. In Bolivia, for example, delinquencies were around 47 percent in the 1970s. Over 50 percent of the loans made through the cooperative system in Thailand were in arrears in the 1980s. Delinquency rates of 50 percent were observed in India, 40 percent in Malaysia and Nepal, and about 80 percent in Bangladesh (APO 1984, 1988).

Because of inefficient operations and low collection rates of many government supported lending institutions, official agricultural credit programs often have been extremely costly to governments and remained without adequate developmental impact. For example, the official rural financial system of Mexico has cost the government, over an extended inflationary period, more than one dollar for each dollar lent. It is not a coincidence that the rural credit systems of the World Bank's three most important agricultural credit borrowers, Brazil, Mexico, and India, have all experienced severe problems and placed enormous burdens both directly on government budgets and less directly on the external debt position. The government of Brazil has at times allocated about one-fourth of its total agricultural expenditure to maintain the agricultural credit system. A major lesson cited by an OED report of a credit project in Brazil is "the inappropriateness of subsidized credit as a tool for agricultural development" (OED 1989). A Bank-sponsored study of credit impact indicates
that the main effect was a substitution of purchased inputs and machinery for labor, with a very modest change in output (Binswanger and others 1989).

Successful Credit Programs

Notable exceptions are the agricultural credit systems in the Republic of Korea and Taiwan (China), where collection exceeds 90 percent. These systems’ high recovery rates have frequently been ascribed to strong village cooperative systems and social cohesiveness that have provided repayment incentives and enforcement mechanisms. Together with a small number of successful projects in other parts of the world, these systems have shown that although agriculture is subjected to higher risks than other sectors, satisfactory repayment rates can be achieved if the right incentive and enforcement structure exists.

Arrangements such as lending groups or credit cooperatives have the potential to reduce both the transaction costs of lending to small farmers and the risks involved. Successful group lending programs have shown the importance of factors such as homogeneous borrowing groups, which are jointly liable and assume some of the managerial and supervisory responsibilities, a common bond other than credit, and denying access to future credit to the whole group in case of default by any member. Important factors for success of credit cooperatives include bottom-up institutional development, extensive training at all levels, reliance on savings mobilization and equity contribution rather than external funds, slow expansion of cooperative activities, and strict monitoring and auditing. The limited success observed with such arrangements to date is mostly because of shortcomings in their implementation and general deficiencies such as low interest rates rather than factors inherent in their design (Huppi and Feder 1989).

In recent years, other models of successful rural finance institutions have emerged. Their success may assist us in better understanding the policies, mode of operations, and incentives that generated significant outreach and financial viability. The Indonesian general rural credit program was introduced in early 1984 by Bank Rakyat Indonesia - Unit Desa (BUD) as a supply-led institution. Over a relatively short period of time, from 1984 to 1989, it has become extremely successful in mobilizing and servicing deposits and savings and has emerged as a well-balanced financial institution. BUD has provided depositing and saving services to a large number of clients and its savings volume currently significantly exceeds its outstanding loan portfolio.

Effective policies and management practices stand behind BUD’s success. The major policies have been (a) applying high market on-lending interest rates that cover the overall cost of operations; (b) paying high positive interest rates on savings; (c) applying mobile banking techniques that contributed to maintaining administrative costs in check; (d) applying significant incentives to borrowers for timely repayment in the form of interest rebates; (e) promoting and paying bonuses to staff based on branch financial performance; and (f) applying simple, clear, and efficient methods of loan approval, disbursements, loan repayments, and saving mobilization. Clearly, applying these policies in a stable economy, wherein inflation was controlled below 10 percent a year, has contributed significantly to the program’s success. Over a period of a few years, and despite the high annual growth rate in outstanding loan portfolio, BUD became subsidy independent, and simultaneously obtained high return on its equity over the recent years. The role of subsidized financial resources in the initial stage of BUD’s operations was neither crucial nor necessary. In retrospect, one may argue that BUD actually needed nonsubsidized financial resources to resolve a
negative cash flow problem in the first years of operations, rather than concessional financial resources (Yaron 1992).

The Bank for Agriculture and Agriculture Cooperatives (BAAC) in Thailand was established in 1966 as a government-owned bank to provide financial assistance to agricultural producers. Currently, it provides credit and other financial services to more than one-half of the rural population. It gradually has made progress toward subsidy independence by using efficient modes of operations that resulted in very low transaction costs. Its overall administrative cost, measured against its total assets, is about 4 percent as a result of group lending and the use of mobile banking. It has achieved high loan recovery in lending to individual farmers and promoted an advanced financial reporting system. Recently, the highest growing source of finance has been voluntary savings, thereby shifting its initial characteristic from a supply-led institution to a more universal, well-balanced financial institution, as well as reducing its already modest subsidy dependence.

These two institutions differ in many ways in their mode of operations, yet they both have progressed significantly in the right direction by (a) applying market-oriented onlending and deposit interest rates; (b) emphasizing saving mobilization; (c) providing staff and clients with significant incentive and bonus schemes; (d) applying efficient mobile banking systems; (e) achieving high loan recovery; and (f) making use of some sort of social mechanism in efficient, rapid screening and approving of loans. It should be underscored that beside stable economies, economic policies enhancing more liberalized financial markets in the two countries contributed to the two schemes improved performance.

The Impact of the Bank’s Recent Policy Paper on Financial Sector Operations on Future Agricultural Credit Lending

The Bank’s recent policy paper on financial sector operations considers directed credit to be a potentially useful tool for opening credit access to activities or groups whose access was impeded by inadequate information or other market imperfections. Although there were exceptions, it is generally recognized that directed credit programs often have been misused with negative consequence for resource allocation, income distribution, and macroeconomic management. Therefore, it is recommended that financial sector strategies as well as Bank lending operations that involve directed credit be carefully analyzed and well justified to ensure that objectives are adequately focused and achievable and that the programs would not outlive their usefulness.

Past experience has led the Bank to look at the matter more cautiously and to require an explicit justification before embarking on directed credit schemes or lending through specialized sector credit institutions. The conditions for ensuring that they would be engines of growth and consistent with efficient financial sector development had to be very carefully defined and established. The choice, however, of whether the Bank supports sectoral institutions or universal commercial banks should ultimately be determined by the market; there is nothing inherently wrong with a specialized institution if it is competitive and can survive in a competitive framework. The criteria being proposed for evaluating the financial intermediaries, therefore, should be uniformly applied across all institutions. This implies pursuing participation from many financial intermediaries in agricultural credit project implementation, rather than maintenance of the position of a national agricultural Bank as an exclusive intermediary.
The last 2 years have witnessed a major reevaluation of the Bank's approach, with much tighter standards on financial sector operations, as well as lending through financial intermediaries. This more restrictive approach has already generated a decline in Bank agricultural credit lending through financial intermediaries over the last 3 years. In summary, the current Bank policy does not exclude directed credit programs per se from Bank support. It simply subjects them to a more restrictive burden of proof test. The extent to which the current, more restrictive requirements differ from past performance is highlighted by the eligibility criteria for financial intermediaries' participation in project implementation. The Bank's recent Operational Directives on Financial Sector Operations reads: "Participating FIs should, at a minimum, demonstrate a collection rate, which, given its lending margin and applicable tax rate, and taking into account a realistic estimate of possible portfolio losses, inflation, and the opportunity cost of capital, avoids the erosion of its capital."  

Implications for Future Agricultural Credit Lending

Targeting lending for agricultural credit projects may become warranted when it follows significant changes that have occurred in the economy and that are expected to have substantial impact on the rural sector. The recent Bank policy paper on financial sector operations reads: "In many developing countries, poor information, unfamiliarity with modern financial instruments and institutions, lack of lender experience and expertise in evaluating certain activities or new technologies, absence of confidence between borrowers and lenders, uncertainties regarding the permanence of economic reforms, or simply tradition may limit market response to the opportunities opened and demands made by financial sector reform and broader economic adjustment. Properly designed and complemented by necessary policy reforms, targeted credit can act as a catalyst to overcome such obstacles, opening market access to previously excluded groups and sectors, such as microenterprises and small farmers, thereby promoting the development of credit markets."  

It has to be, however, substantiated that full reliance on market forces is not preferable, and that, in the absence of the proposed intervention in the financial market, the supply response or the adoption of new technologies would be unacceptably slow. In the circumstances outlined, agricultural credit projects serving as a catalyst in growth should be accompanied by the removal of distorted policies that inhibit demand for agriculture investments. Introducing a specific targeted line of credit aimed at speeding up supply response can be a complementary measure to the removal of price controls on agricultural products that hindered market-induced lending to the rural sector. Similarly, directed credit can be useful when the banking system is considered to be responding too slowly to other significant reforms such as changes in the terms of trade of the agricultural sector because of trade liberalization, a sharp correction of an overstated rate of exchange, or removal of other "urban bias" policies. Under such circumstances, inadequate information on the creditworthiness of potential borrowers, lack of confidence in the sustainability of the changes introduced, and excessive risk aversion by lenders and borrowers can be mitigated by a directed line of credit.

There may be a justification for an agricultural credit line aimed at speeding up growth when reforms are introduced to remove bottlenecks resulting from an inadequate land tenure system and deficient contract enforcement arrangements. Likewise, the introduction of new and unfamiliar technologies characterized by capital intensity, may benefit from a directed credit at the initial stage. It must be established, however, that an a priori justification for intervention in the credit market
rather than alternative ones exists. Possible direct and indirect negative implications of the interventions ought to be fully considered.

The evaluation of the proposed interventions should verify that other problems afflicting agriculture are not assessed to significantly diminish the desired effect of the intervention in the credit market. When subsidy is granted, the overall subsidy cost in operating a program of rural finance should be made transparent to ensure adequate assessment of the desirability of the intervention in the financial market as well as the use of quantified milestones in progress to be made toward subsidy independence. The methodology of computing the Subsidy Dependence Index (SDI) of a rural finance institution is instrumental in (a) placing the total amount of subsidies received by an institution in the context of its activity level, the interest earned on its loan portfolio (similar to calculations such as effective protection or job creation cost); and (b) tracking progress made by an institution in reducing its subsidy dependence over time.

When such an intervention in the financial market is considered warranted, it is essential to ensure that the "infant industry" is supported on a transitory basis. This would avoid unwarranted prolonging of the intervention given that market forces are assumed to catch-up and resolve the transitory issue of inadequate allocation of funds to priority sectors and activities. The "infant industry" approach, by definition, conveys the message that an intervention should eventually be phased out.

Given the poor state of affairs in the agricultural credit systems of many client countries, many rural credit operations will need to be conditioned on, and some may include as a component, a significant financial sector reform. The reform may be specific to agricultural credit, or deal more generally with the financial system, depending on the nature of problems faced. The aim of the reform would be to eliminate obstacles to the efficient functioning of the rural credit market, in the broadest sense, under competitive conditions such as removal of monopoly positions in access to government rediscount facilities, elimination or tighter targeting of subsidies, and deregulation of interest rates.

The potential viability of existing specialized agricultural credit institutions in a reformed competitive environment should be a condition of their participation in Bank sponsored rural credit operations. In many instances, a significant institution building component may be warranted involving an overhaul of the institution's structure and mode of operations focus on enhanced efficiency, aimed at reducing transaction costs and improving loan collections. Reliance on savings mobilization, instead of on rediscounting facilities and applying adequate accounting, auditing procedures, and managerial information systems are essential for achieving viability. Appropriate staff training and staff and borrowers' incentives, emphasis on strict loan collection and its proper measurement are key ingredients of viable institutions. The managerial information system should make transparent the social cost of state support to the credit institution, to allow public debate on its desirability, as well as tracing changes in the subsidy dependence over time.

The impressive experience of the rural credit system of Bank Rakyat Indonesia - Unit Desa (BUD) suggests that, in contrast to the frequent failures of rural credit systems, a well-designed rural finance program can be successful and profitable (Yaron 1992). In a relatively short period the BUD program became subsidy independent and achieved high return on its equity. It increased its assets annually by more than real 30 percent over the period 1986-89, and applied positive lending and depositing interest rates. BUD succeeded to rely on savings mobilization as its main growth factor, reaching savings amounts that significantly exceeded its loan portfolio by the end of 1990. This suggests that there was a tremendous demand for saving services in the rural areas that allowed BUD to become, after a very short period, independent from donor funds. Loans were granted to all income-generating activities and were not limited to agriculture, thereby achieving a more balanced lender risk distribution.
Where smallholders' access to credit is a valid concern within a Bank credit operation, project design should make as much use as possible of self-help groups and other grassroots voluntary organizations, which allow the reduction of transaction costs and lending risks. However, given the lessons learned about the prerequisites for successful outcomes with such arrangements, attention must be paid to the likely effectiveness of existing organizations. Caution must also be exercised in order not to make the existence of local organizations overly dependent on external funds, lest this change their character and cause their demise. This, however, implies a limited ability of such organizations to absorb large volumes of external funds.

Preferred Mode of Assistance to the Rural Finance Institutions (RFI)

State or donor financial support, in the form of making financial resources available (not necessarily at a subsidized interest rate), can constitute an important contribution to a newly established Rural Finance Institution during the initial, negative cashflow stage of the RFI's development. Savings mobilization should not become the minor residual balance, as has often happened with supply-led credit institutions, that constitutes the difference between the loan portfolio and concessional borrowed funds. On the contrary, state or donor lending to the RFI should only assist in temporarily closing the gap between an RFI's fully motivated savings mobilization and its bankable loan portfolio. BUD's successful experience clearly supports this notion. This implies that state or donor support could generally be used for a shorter period of time when compared with past practice of cooperation between supply-led financial institutions and donors. Obviously, the servicing of new clients, opening of new branches, and rendering services to an increased share of the rural population are factors which define the length of the period in which the financial support to the RFI may be useful. The Indonesian example indicates that making funds available was important to the program's rapid growth during its initial stage of development. However, no subsidy in the form of concessional borrowed funds was necessary for its growth, as is demonstrated by its full 1989 subsidy independence. The issue that donor support had to resolve during BUD's initial stage of operations was the availability of funds, not subsidizing their cost.

Institution Building

State or donor support to an RFI should concentrate on institution building and developing to become a viable rural finance institution. Targeted credit without an adequate component of institution building is almost always a guaranteed receipt for prolonged future dependence on donor or state funds and bail-outs. The mere notion that it is considered socially desirable to intervene in the financial market and to use scarce resources for achieving specific objectives implies, in most instances, a need for institutional building in order to ensure that the financial institution involved is on its way to becoming mature, autonomous, and efficient. Care taken in institution building is often the prime difference between an RFI that could eventually become self-sustaining, after a few years of support granted during its start-up period, and an RFI that would need permanent subsidies and bail-outs. The lack of adequate emphasis on institution building in RFIs is a common characteristic of supply-led credit institutions. Too few resources are devoted to guaranteeing adequate training, efficient and meaningful managerial information systems, staff incentive systems, promotion of saving
mobilization, and the like, all of which are crucial to an RFI becoming an independent, well-balanced, and increasingly self-sustainable institution.

**Endnotes**


3. Unpublished data from World Bank study RPO 673-33 "Land Title Security and Farm Productivity in Thailand."


8. This applies to credit programs in all regions, see for example, "Review of Finances Services in Sub-Saharan Africa", Agriculture Division of Africa Technical Department, 1989; and "Latin America - New Directions for Agricultural Credit Projects and Rural Financial Policies", Trade, Finance and Industry Division, Latin America Technical Department, 1989.

**References**


NEW APPROACHES TO SUPPORTING AGRICULTURAL RESEARCH AND EXTENSION
AN INITIATIVE INVOLVING THE PRIVATE SECTOR IN MEAT AND LIVESTOCK RESEARCH

Nigel H. Monteith*

While the Meat Research Corporation (MRC) in Australia is not a fully privatized body it has developed a view of research and research funding that is essentially a private sector view. The particular features of its operations reflecting this view are guided by its mission statement which focuses on the funding of: "Consumer-driven research and development managed for a profitable industry."

Unlike the traditional groups, which disburse research grants according to the perceived merits of applications from the research community, the MRC is an investment bank, investing funds raised directly from the industry itself and the federal government. The MRC is accountable to its shareholders for the return on investments and hence has most of the control and decisionmaking elements in place normally associated with a venture capital group.

Structure and Operation of MRC

The Corporation was established to promote and fund research and development in the production, processing and marketing of cattle, sheep, goats, and buffalo. About two-thirds of the investments are made in the cattle industry, one-third in the sheep meat industry, and very little in the rest.

MRC was established in 1985 as a Corporation by an act of parliament. It has a board of eleven who are selected by shareholders, through industry representatives, on their skills in finance, business operations, marketing, or various industry operations. The Directors must conform with the Companies Act and comply with their obligations to benefit the Corporation as a whole. They do not represent any particular faction within industry and government, and a few are not even associated with the meat and livestock industry. All except two come from the private sector. The Corporation must hold an annual general meeting where the levy payers (both producers and processors) can dissolve the board, if they feel research is not yielding results relevant to their needs.

The staff of twenty-six handle a budget of US$34 million this year, rising to about US$40 million in the next year. The Corporation invests in a wide range of research and development, both on-farm and off-farm (table 1).

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* Nigel H. Monteith is Chairman, Meat Research Corporation of Australia.
Table 1. Areas of MRC Research and Development

<table>
<thead>
<tr>
<th>On-Farm Research</th>
<th>Off-Farm Research</th>
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<tbody>
<tr>
<td>Vaccines</td>
<td>Improving Production</td>
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<td>Sustainable Production</td>
<td>Stress</td>
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<td>Pastures</td>
<td>Feed Conversion</td>
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<td>Weeds- Bio-Control</td>
<td>Genetic Improvement</td>
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<tr>
<td>Embryo Technology</td>
<td>Bruising</td>
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Research and Development Investment Study

The MRC initiated a research and development investment study (RADIS) in order to establish investment priorities based on impact on the industry. The study initiated industry, consumer, and global environment studies using both brainstorming and investigative or analytical approaches to establish constraints and opportunities to the year 2010.

Priority investment areas were established with the help of a linked combination of national and global computer models. RADIS exposed a series of constraints and opportunities. By assuming certain incremental changes in parameters when constraints were overcome, RADIS calculated the annual benefit to the industry from a series of major topics after 5 years of research work. Funds to be invested were allocated by assuming rates of return are normally high for research and if rates of return could be kept constant over the range of topics, allocation would be in proportion to benefits. Calculation of costs at this stage is impractical.

The priority investment areas were incorporated into a 5-year plan. The priority areas were (a) consumer, products, and marketing; (b) market access and trade barriers; (c) product description and communication; (d) processing efficiency; (e) coproducts; (f) efficient and sustainable production; and (g) selected threats. Annual benefits from research into these areas are shown in figure 1. RADIS identified a number of key programs arising from the seven industry priorities based on three main thrusts—consumer needs, efficiency of the industry, and sustainability. MRC has adopted the project cycle utilizing RADIS as equivalent to a sector study followed by identification of key programs and rigorous preparation (with detailed project design, costing, benefits, and risk analysis) and independent appraisal.

Tendering

Implementation of research project components are subject to a tendering process. The Corporation has adopted a system in which components are subjected to competitive bidding and depending on the importance of leakage of research results to competitors bidding could be on an international scale. All investments are the subject of detailed contracts with research organizations, consultant groups, and processing companies. Each contract has specific and detailed terms of
Technology Transfer

MRC places great importance on technology transfer, arguing that unless research results are relevant and readily available to the end user, investment in Research and Development is useless. At the same time, the Corporation has recognized that conventional technology transfer systems on-farm are not working efficiently and systems focused on off-farm research results are almost absent. The Corporation has initiated two main thrusts in technology transfer on-farm, both designed to involve the end user early in the research process to ensure the research is relevant and to ensure a sense of ownership by the end user.

MRC has funded and coordinated the formation of Technology Transfer Advisory Groups (TTAGs) consisting of three to four end users in each group. The groups confer with researchers and advise them and the MRC on the practicability and direction of the research to ensure results can be used readily and economically within the appropriate production systems. TTAGs also advise on the best way to transfer the technology.

The Corporation has initiated a pilot scheme forming farmer groups that are essentially self-help groups designed to generate and contract research relevant to their own priorities. The Corporation’s consultants for this pilot program are using problem census and problem solving techniques similar to those used in a major Australian Aid project in Thailand.

MRC planners believe public services normally supplied by departments of agriculture will eventually be reshaped to become suppliers of information on request and trainers of group facilitators. Such organizations will play a purely support role. Supply companies and private
consultants are becoming much more prominent in technology transfer and can be used more effectively in technology transfer.

In the case of research results with the potential to be taken up by the commercial sector (primarily off-farm, processing equipment, new products, packaging, veterinary supplies) there is at least some market-driven incentive for some commercializers to work with researchers. However, the high risk and lack of knowledge, background, or feeling of ownership perceived by potential commercial users often means a dead end for many research results. Research is often looking for a market rather than the market looking for research.

To try to overcome this problem, MRC has developed several initiatives:

- The Corporation funds 50 percent of the cost of development of a new product. The move is designed to assist meat companies to work alongside researchers and establish their own R&D group.
- The Corporation established one company and has looked at investment in other companies with the potential to further new technology. In these cases, MRC would operate in a similar manner to the International Finance Corporation (IFC) by providing equity and loans to the company and withdrawing its interest as soon as the company is successful.
- The Corporation is presently negotiating with a venture capital group to set up an investment fund for commercialization of research results.

In all these cases, the MRC aims to inject "seed" money or risk capital to link the marketplace with research and to provide the means to ensure that research is relevant to the end user and used by the end user.

Conclusion

The major features of MRC operations, which distinguish it from traditional research funding, are based on a strict focus on research to provide what the consumer wants and research designed to ensure that the industry operates as efficiently as possible. This focus is lost if research planning and funding is left to researchers.
THE UNITED KINGDOM EXPERIENCE
IN THE PRIVATIZATION OF EXTENSION

Paul Ingram*

In the United Kingdom, in 1985, the decision was made that farmers could bear part of the cost of the extension services provided in England and Wales by the Agricultural Development and Advisory Service (ADAS) of the Ministry of Agriculture, Fisheries and Food (MAFF). Charging began in April 1987. Throughout that period, and until November 1988, the writer was part of the ADAS management team, first as a member of the Steering Group which planned the change and then of the Board of Management which implemented it.

In making the change from a free extension agency to a business charging commercial fees for its advice, products, and services ADAS has been remarkably successful. Despite being part of a government department with the constraints that imposes, and despite some reservations that an agency of government could be sufficiently aggressive to succeed in a commercial environment, ADAS has consistently met its financial targets and is still the major advisory agency operating in England and Wales.

The Background

Extension services in the United Kingdom have always attracted interest from workers in other countries. On the mainland of Great Britain there are two models. One is that in Scotland, based upon a number of agricultural colleges, the staff of which do research, teach, and provide extension services. In England and Wales, by far the largest of the advisory and extension services in the United Kingdom, the model is different. It is this service, once ADAS of the MAFF, with which I have been particularly concerned and which has led the way in commercializing extension work in the United Kingdom.

Parts of the advisory service in England and Wales have a long history, dating back as far as 1822. In 1946 government added the National Agricultural Advisory Service formed from the County Advisory Services developed during the war to promote food production. All the government services in England and Wales were brought together in 1971 to form the Agricultural Development and Advisory Service. This comprehensive organization was intended to provide independent and impartial advice and services and to conduct experimental work for the agricultural, land-based, and allied industries. It also carried out a substantial volume of statutory work on behalf of government, for example, the control of animal disease, and made technical input into the development of agricultural policy.

* Paul Ingram is head of the Agricultural Services Department at Barclays Bank PLC, London.
By 1978 ADAS comprised about 5,400 staff. Of these 1,100 were agriculturalists, 730 agricultural scientists providing backup services or engaged in research, 265 were professional officers in the land service, 40 were drainage engineers, 600 were veterinary surgeons, and there were 40 professional civil servants in central units. In addition there were about 2,500 technical support and industrial staff.

At this time ADAS operated through a structure of six regions made up of twenty-four divisions with twelve experimental husbandry farms, seven experimental horticultural stations, four central scientific laboratories, and twenty specialist units of various kinds. The costs of the service at that time were about £60 million a year, receipts were about £3 million giving a net cost of about £57 million. Of its total activity about 43 percent was in statutory work, very much of this being from the veterinary service, 35 percent in research and development, 17 percent in advice, and about 5 percent on policy activity.

The extension activity of ADAS was carried out mainly by the qualified agriculturalists of the agricultural service supported by the 730 research and backup scientists of the agricultural science service. These groups together formed a potent unit for the provision of free advice to farmers. The service had good laboratory facilities to support advice, it embraced a very wide range of disciplines from plant pathology to farm business management and was able to deal with virtually any query on farm production.

Though ADAS was the biggest extension service in England and Wales there were at the time independent groups selling advice to the industry. These were in the main relatively small, often one-man units, but their presence and their continued existence clearly showed some farmers were prepared to pay for advice and these units did from time to time remind government that the provision of free advisory services was, in their view, unfair competition.

A New Approach

During the early 1980s in the United Kingdom the government, headed by Prime Minister Margaret Thatcher, introduced a new attitude to its role. When in 1984 MAFF appointed a new Director General of ADAS he was asked to give attention to developing the future shape and direction of ADAS, in particular considering whether some services could be provided by the private sector and how far there was scope for transferring to the user the cost of the services that ADAS provided. In short the new Director General, Professor Ron Bell, was asked to consider whether ADAS advisory services could be commercialized.

He reported in 1984 recommending, among other things, a marketing approach should be adopted in the provision of all advice to the industry involving continual consideration of what the customer wanted and was prepared to pay for. Also wherever there was a clearly identifiable and substantial benefit to the customer, ministers might like to consider whether the customer should bear part or all of the cost of providing the service. This conclusion, that in principle it was appropriate for farmers and others who used these services to contribute to their cost, was endorsed by the ministry in 1985. The Director General was then asked to do further work that involved the setting up of a Steering Group to develop these ideas and plan a timetable.

This policy decision was entirely in keeping with government policy at the time that "the frontiers of government should be rolled back" and the best determinant of what services government supplied was the willingness of customers to pay for them. At the same time it provided the
opportunity to revitalize the advisory service which, apart from bringing together its component parts in 1971, had operated in a very similar way for about 35 years. The general agricultural environment was also encouraging. The imperatives to develop food production were less convincing. With the entry of the United Kingdom into the European Community, farm product prices had risen and a considerable stimulus had been given to agricultural output. Farmers in the United Kingdom had relatively large operations, were technically well developed, and increasingly good business managers. There were clear signs that the community was developing considerable food surpluses and, although government saw opportunities for increasing production in the United Kingdom, it was necessary that any increase should be in response to the needs of the market.

As one would expect there were, within ADAS, some reservations about the need for, or the potential success, of a policy directed toward charging customers for advice. The initial targets set were, however, modest; it was envisaged that roughly 20 percent of the total cost of ADAS might be met by selling services to customers by the year 1987-88.

The Work of the Steering Group

This small internal group had to make some early decisions. It was seen at once it would be difficult to run services that were charged for in parallel with services that were not. An early decision was taken that as far as commercial advice was concerned there would be no special categories of farmers, such as small farmers or farmers in disadvantaged areas, who would continue to receive free or subsidized services in comparison with farmers elsewhere. It was accepted that government should continue to supply some free advice on such matters as control of pollution, the conservation of the countryside, and animal welfare.

The Steering Group decided that a new management body was required for ADAS and there should be immediate market research into the needs, attitudes, and willingness of farmers to pay for services. There also was a need for parliamentary legislation to give ADAS the necessary authority to charge for its services; this was eventually provided in the 1986 Agriculture Act. This empowered the minister to supply services relating to the production and marketing of agricultural produce and other food, countryside conservation, and other rural activities by providing information, advice, instruction and training, undertaking research and development, and laboratory work of various kinds. The minister was required to establish an organization through which these services could be delivered and was allowed to provide them either free of charge or for such reasonable charge as he might decide.

Early in its work the Steering Group recommended, and it was agreed, that a board of management be formed for ADAS. This would be chaired by the Director General, and made up of his heads of service, a few other senior departmental heads in the ministry and, a considerable innovation, three appointments from outside the ministry. One was made from a large international company, another from a company concerned with developing new technology, and the third was a farmer with particular interests in environmental conservation. At the same time it was decided to set up a marketing unit in ADAS, a decision, which in the light of experience, reflected the real change in culture from a public service to a commercial organization.
The Marketing Approach

In 1985 ADAS carried out market research to explore the potential customer base for charged ADAS services. A random stratified sample of 1,000 farmers, out of the customer base of about 180,000, were interviewed and asked their opinion of products and pricing policies. The services offered to them included (a) subscription services, allowing a relatively small annual payment for the provision of telephoned or postal information, (b) consultancy, allowing the farmer to buy advisory time at an hourly rate, (c) contracts, allowing the farmer to negotiate a price with ADAS for a particular bundle of services over a period of time, and (d) specific products aimed at identified needs within the industry.

The attitudes of farmers revealed in the market research were sufficiently supportive to confirm the board’s belief we were moving in the right direction. It seemed likely ADAS would prosper best by pitching itself at the quality sector of the market and would maximize its revenues by charging higher rather than lower prices. On this basis, analysis showed ADAS could move quite quickly to an advisory income of £5 million a year and the total market was at that time estimated at £12 million which could be achieved in a few years time.

As soon as the small marketing unit was established it was able to identify a number of potential considerations to be dealt with before chargeable services were launched at some time in 1987. These included the organizational structure of the service, segmentation of its market, the identification of products, customer needs and internal issues such as billing and accounting procedures, and the training of its staff in the marketing of products and services.

The Use of Consultants

In the time between the decision to begin charging, taken in 1985, and the commencement of charging on 2 April 1987, ADAS employed a number of consultants to assist in developing its policies and changing its attitudes. The marketing consultants found the ADAS situation somewhat difficult. This was because the service was embedded in a major civil service department with some noncommercial constraints on the way in which it could behave. The responsibility of ministers to Parliament for instance and the concerns of Treasury about management of public expenditure meant that ADAS could not do all of the things a comparable commercial organization might do. The consultants nevertheless made a considerable number of recommendations.

Most importantly they identified the need to change the ethos of the organization. To this end ADAS next used consultants in marketing and selling techniques who trained over 2,000 ADAS personnel before the launch of commercial services. This training included sales management, marketing and selling skills, customer service skills, and negotiation and presentation. The relatively long development period, from 1985 to 1987, was particularly valuable in allowing the whole organization to undertake this essential training.

There was some resistance to the ideas presented to the staff but in most cases consultants were able to convince staff that success depended upon the adoption of these proposals. Throughout this phase groups of board members spoke to staff to explain what was happening and what would be expected of them.
Selling Commercial Services

When ADAS began charging for the majority of its advisory services on 2 April 1987 staff had clear objectives, had been trained in new skills, and knew what products they could offer to farmers. ADAS had adopted as its mission being the leading consultants to land-based industries in the United Kingdom working with clients for the provision of quality services for the benefit of their businesses. In order to do this the field staff of ADAS, used to working as extension officers promoting new techniques and offering free advice to farmers, had to begin selling and asking farmers to pay for what was provided. Although ADAS now had a corporate image, product literature, a pricing schedule, and had decided to sell subscription schemes, consultancy, contracts, and products in ten service areas success was to depend upon the efforts of individuals and their relationship with customers.

The existing organizational structure of ADAS was maintained throughout this transition. This presented some problems in defining the roles of certain parts of the organization but with the exception of combining some units previously located in different services of ADAS into one new unit, the Farm and Countryside Service, no other changes were made.

The role of middle management in making this change was crucial. At divisional level, a unit of about eighty staff, it was the role of the head of the division to direct, encourage, and monitor performance. At this stage, though the service had overall revenue targets, individual targets were not set for particular officers in the service. It was felt this would be counterproductive when managers had no real assessment of the market in particular areas or the selling abilities of individuals on their staff. Some members of staff took to the new regime very easily, others not surprisingly had difficulties with it. Perhaps the main problem from converting from an extension service to a commercial consultancy was that advisors were diffident about charging sufficiently high prices for their services. There was a definite tendency to underprice and overdeliver.

The run-up phase to charging, in addition to allowing ADAS to train its staff, had provided time to prepare the industry for the change that was being made. Before the actual date on which charging began local advisers had spoken to farmers with whom they already had relationships and explained to them how they could benefit from the new situation. Initially, subscription schemes introduced many farmers to ADAS-charged services. These were particularly suitable for smaller farmers who could not justify the cost of a consultant visiting the farm but who could get the essential information they needed from newsletters or telephone contacts. Larger and more sophisticated businesses were quite willing to enter into tailored contracts with ADAS for the supply of a range of service timed to be relevant to their business enterprises.

From the beginning of ADAS charging there were very few complaints about the service and very few refusals to pay the charges that were applied. Farmers continued to express reservations about the service provided by the service provided but only in general terms. There was still some concern that ADAS was a "civil service" organization displaying noncommercial values. ADAS worked hard to show the industry it was determined to make its commercial future a success.

The market research that had been carried out gave ADAS confidence in its prospects and at the same time allowed it to negotiate revenue targets with the ministry and Treasury. It was a considerable comfort to managers in the service when targets were met in the first year but they have in fact been exceeded in every year since then. The commercial performance of ADAS advisory services and the percentage recovery of costs are set out in table 1.
Table 1. ADAS Advisory Services and the Percentage Recovery of Costs

<table>
<thead>
<tr>
<th>Year</th>
<th>Target £m</th>
<th>Revenue £m</th>
<th>Cost £m</th>
<th>Percent</th>
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<tbody>
<tr>
<td>1987-88</td>
<td>5.0</td>
<td>5.4</td>
<td>29.7</td>
<td>18.0</td>
</tr>
<tr>
<td>1988-89</td>
<td>6.0</td>
<td>8.6</td>
<td>45.0</td>
<td>19.8</td>
</tr>
<tr>
<td>1989-90</td>
<td>9.9</td>
<td>11.3</td>
<td>45.5</td>
<td>24.8</td>
</tr>
<tr>
<td>1990-91</td>
<td>13.7</td>
<td>14.1</td>
<td>47.5</td>
<td>29.6</td>
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</tbody>
</table>

In achieving this performance ADAS increased its penetration of the market in terms of numbers of customers and the range of products and services it provided. By April 1990, ADAS had in fact provided services to 85,000 customers of various kinds. Many of these were of course farmers but they included local government authorities and major national oil companies. The services provided ranged from advice on the production of conventional farm crops to such things as the reinstatement of land around major oil pipelines and the development of land for major leisure complexes.

The Key Elements of ADAS Experience

The successful conversion of ADAS from a public good organization supplying free services to a commercial consultancy highlights issues still of concern within ADAS on which progress is still being made. As soon as the ADAS Steering Group was set up in 1985 it was apparent that no one on it, and very few people in the organization, had any commercial experience in the sense of having sold services. ADAS was very strong on technical expertise and had contacts with a very high proportion of the farmers in England and Wales who had been recipients of free advice or information, but it was soon realized that technical expertise was not all that was going to be required in future.

Some new needs very soon became apparent. It was obvious the service would need a working accounting and billing system once charging was introduced. This might seem like a simple mechanical operation, but in the case of a large organization operating over a wide geographical area and dealing with a very large number of customers it proved to be a complex operation. It was also obvious that the service would find itself in a new kind of relationship with its customers even though the nature of that relationship was not at that time fully understood.

The key lessons included, if commercial activity is to succeed, management needs to make a wholehearted commitment to commercial principles; anything less is likely to mean failure. Management then has to carry the rest of the organization with it. A marketing approach, with the absolute acceptance that the values of the organization must change to become those of the customer and not the organization itself, is absolutely essential. This cannot be stated too often or too strongly.
Old habits die hard and there must be constant review of the motives for the activities of the organization.

The market has to be defined in terms of customers, products, and prices. ADAS apparently had an obvious market but there has been continual work in defining both its old customers and new ones in ways which would assist the development of the business. If the organization is to be successful it must develop skills in marketing and selling. Extension workers, though used to persuading farmers to adopt new practices, may not easily accept that they should sell commercial products. Building these new skills into ADAS meant a large program directed toward conviction and skill development. A commercial organization must be active and not reactive. It is necessary to seek work. Products have to be developed that have definition and identity in the eyes of the customer. Pricing policy, though determined by the market place, needs careful monitoring to be sure services are not sold too cheaply. An organization of the size of ADAS has continuing needs for consultancy and market research. Commercial organizations must be lean, fast on their feet, and continually innovative.

The major change for ADAS in becoming a commercial organization, leaving aside the internal organizational changes necessary in its relationship with government, is the change in relationship with the customer who now pays for services. As soon as the recipient becomes a paying customer, expectations alter. The providers of services have to realize they must sell what the customer wants, not what the providers might have on the shelf, might want to sell, or might think the customer either wants or needs. New standards of service are required both in speed of reaction, definition of contracts, presentation of the selling stage, and quality and delivery time of the product. Individuals in the organization continually need to strengthen their skills and attitudes in relation to customers, marketing, selling, negotiating, and delivery.

The Next Steps

In 1987 the United Kingdom Government, as part of its drive to introduce market forces into government activity introduced proposals known as "The Next Steps." These required departments of state to identify those parts of their activity which could not be merely commercialized but also moved to an arms length relationship with government in the form of executive agencies.

The ministry of agriculture decided that ADAS in its various parts would progressively move to agency status. For the Advisory Service this change is planned to be achieved by April 1992 under the management of a new Director Designate, Dr. Julia Walsh, who was appointed in 1991. Dr. Walsh came to the government service from industry, having been the managing director of a commercial firm in the scientific sector. The planned move to agency status, associated with which are targets for a self-financing service in the long-term and possible privatization, has been the catalyst for further major changes in the organization. These concern improving the organizational structure and achieving material savings in cost.

The immediate cost and revenue target for ADAS services is to recoup 50 percent of total costs by the year 1993-94. The change to agency status and the detailed plans now in hand will certainly help achieve that aim. In broad terms it will require, for instance, a 15 percent saving in costs and an 80 percent increase in revenue or some equally effective combination of the two. It is worth noting that achieving 100 percent cost recovery would require a cost saving of about 30 percent and a 300 percent increase in current revenues.
So far ADAS has been addressing itself to issues on the revenue side, particularly relationships with customers. These will certainly not disappear and ADAS in addition will continue its concentration on product development, quality assurance, and market analysis and development. ADAS already, for instance, provides consultancy and services to overseas markets. Having successfully met its revenue targets in the first 4 years of charging, ADAS is now making a determined assault on costs. The savings proposed mean that ADAS, basically the farm and countryside service formed in February 1987, will become a very different organization from the one it was when the process began in 1985. Several tiers of management are to be removed. From having had six regions and twenty-four divisions, the whole commercial activity will, in 1992, be focused on thirteen business centers located in England and Wales. Management will be further devolved with considerable savings in senior posts being made in the head office structure. At the same time the marketing element of ADAS management is to be strengthened, clearly expressing the change in focus from a technical extension service to a commercial consultancy.

Everyone associated with the conversion of ADAS, from management to field staff and including its customers, would say the change had been made successfully. This is not to say it was easy either at board level or for extension workers being asked to change their method of operation or for farmers used to the free support of a very well-equipped service. Though ADAS has felt some stresses, its success is the result of very early determination to succeed and to do so by basing the work of the organization on the wants of its customers rather than on any internal priorities. If this has not always been successful it seems not to have shown on the surface or to have discouraged its customers from continuing to use ADAS advice.
AGRICULTURAL DELIVERY SYSTEMS
FROM AGRICULTURAL EXTENSION TO RURAL INFORMATION MANAGEMENT

Willem Zijp*

Introduction

Information is an essential production factor in agriculture. Farmers need information to improve or adapt their farming. Farmers need extension only to the extent that it can provide them with relevant and timely information. Farmers will only pay for extension if the information is not obtainable for free and if they perceive the marginal benefits to be greater than the marginal costs. The distinction between information and extension is relevant because information is much wider than extension. Information is what farmers talk about with their wife or husband, their neighbors. It is what they hear from radio, what they read and hear from extension.

Rather than trying to define extension, five common factors have been identified by Zuurbier (1984): (a) it is an intervention; (b) it uses communication for change; (c) change must be voluntary; (d) it works through planned processes and outcomes; and (e) it is institutionalized. Many governments have made great efforts to provide farmers with relevant information and technology, usually through public extension services. The World Bank has assisted many governments to improve the generation, transfer, and utilization of agricultural information. Worldwide the Bank has provided more assistance for extension than all other donors combined.

This presentation is divided into three parts. First, some background: how much has been invested? what lessons have been learned? what technologies have been developed?, and what are the remaining questions? Second, five major issues merit review: (a) a lack of common purpose, particularly in public extension services; (b) a lack of accountability in relation to the clientele; (c) changes in information needs; (d) an expanding audience; and (e) a lack of policy consistency. Third, what does that mean for the Bank? Recommendations are suggested for each of the five issues and an attempt is made to answer the question where could the Bank invest?

Background

Considerable sums of money have been invested in extension by governments, the donor community, and the private sector. Many people have been trained on the basis of a rapidly expanding body of knowledge about extension. Agricultural technology has been developed to benefit farmers and communication technology to facilitate transfer of information. However, thinking about extension inside and outside the World Bank has now reached a crossroads where decisions need to be made on the future role of extension in the wider field of agricultural information management.

* Willem Zijp is Senior Agriculture Extension Specialist in the Technical Department of the Europe, Central Asia, North Africa and Middle East Region of the World Bank.
Investments in Extension

Investment in extension has recently increased: about one-half of the present extension services in the world were established in the last 10 years. Most of those organizations are publicly funded. About 60 percent of extension's resources are directed toward larger commercial farmers, while the vast majority of small, marginal farmers receive about one-third of all extension resources. In terms of methods used, individuals and groups each receive about 40 percent of extension efforts, while less than one-fifth is allocated to mass media activities.

Global

Global annual expenditure for extension rose from US$3.4 billion in 1980 to over US$6 billion in 1990, about 85 percent of which is public expenditure (figure 1). Public expenditure for agriculture averages about 7 percent of total government expenditure, ranging from 2.2 percent in North America to 9 percent in Africa and Asia. As a proportion of the ministry of agriculture budget, about 12 percent is spent on extension, ranging from 1 percent in North America (where public extension expenditure represents only 30 percent of total extension expenditure) to 22 percent in Africa. About 0.5 percent of agricultural gross domestic product (AGDP) is spent on extension worldwide, with ranges depending on country size and priority given to extension. Per capita income does not have much influence on levels of extension expenditure.

There are an estimated 600,000 people employed in extension services worldwide, with more than 90 percent of these employed by governments (figure 2). Four out of every five extension staff is a fieldworker and about 13 percent of fieldworkers are women, with significant regional differences (FAO 1990; World Bank 1990a, 1990b; World Development Report 1991).

World Bank

The World Bank has been the largest donor for agricultural extension in developing countries. It has lent more than US$2 billion since 1964 to about 80 countries (table 1). The Bank plans to invest some US$150 million a year until 1994 for extension in about thirty countries. Money typically goes toward the construction of houses, offices and training facilities, transport, equipment (both agricultural and audiovisual), and incremental staff costs, including in-service training.

Trends

A number of global trends are of particular interest to extension. Agricultural growth is lower than overall gross domestic product (GDP) growth over the last decade but keeping ahead of population growth, although there are significant regional differences where the opposite is true (figure 3). Thirty years ago, one out of every three people in the world lived in a city. Now that has risen to about one-half of the global population. Agriculture's share of the total labor force has fallen from two in every three to only two out of five (figure 4). Services in a country like the United States, are rapidly expanding, particularly information services, to the detriment of agriculture. Therefore, relatively fewer farmers are being served by an increasing number of publicly paid...
Figure 1. Public Expenditure per Year

Note: Total expenditure >$6 billion; 85 percent public.
Source: FAO.
Figure 2. Extension Personnel by Region

Thousands

Source: Food and Agriculture Organization, 1990.
Figure 3. Growth in Percentages for the 1980-89 Period

Figure 4. Percentages of Totals

Table 1. World Bank Involvement in Extension
(Fiscal years 1965-88)

<table>
<thead>
<tr>
<th>Period (fiscal year)</th>
<th>Number of projects</th>
<th>Total cost of projects</th>
<th>Extension portion</th>
<th>Bank portion</th>
</tr>
</thead>
<tbody>
<tr>
<td>1965-69</td>
<td>6</td>
<td>109</td>
<td>9</td>
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<tr>
<td>1970-74</td>
<td>51</td>
<td>2,000</td>
<td>122</td>
<td>63</td>
</tr>
<tr>
<td>1975-79</td>
<td>181</td>
<td>11,245</td>
<td>1,187</td>
<td>562</td>
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<tr>
<td>1980-84</td>
<td>175</td>
<td>18,841</td>
<td>1,865</td>
<td>792</td>
</tr>
<tr>
<td>1985-88</td>
<td>99</td>
<td>10,036</td>
<td>1,386</td>
<td>641</td>
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<tr>
<td>Total</td>
<td>512</td>
<td>42,231</td>
<td>4,569</td>
<td>2,063</td>
</tr>
</tbody>
</table>


extension workers, although absolute numbers of farmers are still climbing in most developing countries. Public spending on extension is also increasing, but at a slower rate than the increase of staff. This results in services that lack operational budgets to work with.

Knowledge about Extension

Extension is a relatively new phenomena. Some of its earliest roots are traced back to advice given to Irish farmers, following the potato blight famine in the 1840s. However, serious research on extension only started after World War II. The focus of extension science has shifted, but all steps were necessary at the time and essential in getting us where we are now.

In the 1960s the main focus was on interpersonal communication. It was the time of the diffusion of innovation theory, with attempts to categorize farmers on the basis of the speed with which they adopted new technology. A lot of work also was done on differences in communication patterns between groups of two, three, and four individuals. One debate of those days is again very relevant in Eastern Europe: Is behavior the result of a set of attitudes or is it possible to change someone’s behavior through strong enough incentives and who would then care about changes in attitude? Behavioral responses to incentives is at the basis of the debate between shock therapies compared to gradual adjustment.

However, being good communicators did not solve all extensions’ problems. Other factors had to be involved as well. Indeed, the 1970s were the time of constraint identification. Farming Systems Research (FSR) emerged because traditional research did not produce results farmers could use. Discussions concentrated on differences between real, felt and expressed needs. Linkages were identified as weak points in the channels for technology transfer. But even knowing all major constraints and having some solutions did not solve the problems of running an extension service.

The 1980s concentrated on the management side of extension services, with the Training and Visit (T&V) system of extension as the major example. Much of the debate focused on public sector extension and questions were asked toward the end of the decade about its sustainability, particularly where the public services may have crowded out smaller, private and nongovernmental initiatives.
The 1990s are likely to show an interest in a more systemic approach to agricultural information. Demand and supply of information need to be identified, and the most effective and efficient ways to match them need to be applied. Policies, which provide a level playing field to all information suppliers, need to be formulated. Many governments are reconsidering the role of the public sector, both on the level of intervention (should government be in the business of providing extension at all, and if so, to whom) and on the level of policies for research, education, and extension (setting conditions for the private and public sectors to effectively exchange information).

Agricultural Technology for Extension

The past 40 years have shown striking increases in yields, particularly in the major cereals. Maize yields in Mexico quadrupled between the end of World War II and 1975. World wheat yields increased from 770 kilograms per hectare in 1950 to 2,160 kilograms per hectare in 1986. Rice production in Asia and Latin America rose by 3.2 percent a year between 1965 and 1980. In a country like the United States, the key innovations have shifted from mechanization and fertilizers via hybrids and irrigation to improved cultural practices according to Hardy (In Plucknett 1991). In Pakistan, this description would be different, with irrigation a much earlier source of growth, and mechanization not yet having its full impact in many areas. In Romania, for instance, the picture would be different again, with mechanization as an earlier source of growth in the large state-owned farms, but now smaller-scale mechanization will provide a new potential for the emerging class of private, individual farmers. However, globally, the better use of information is a key element in improving yields, particularly information on better uses of water and capital. Biotechnology is expected to drive yield increases of the future.

New technology in the field of animal production is expected to come from increased productivity per head. A greater use of improved technology will again be the key factor in achieving that goal, with extension playing an essential role in getting that technology to farmers. Dennis Avery wrote in the Wall Street Journal of September 20, 1991: "We could feed four billion more people if the Third World fully adopted the latest high-yield farm technologies - including hybrid rice, high protein corn and acid-tolerant seed varieties for a billion acres of currently barren acid soil savannahs." He goes on to say that farmers need to be better informed about these new opportunities.

On the other hand, it has proved difficult to service areas of lower production potential and the diverse needs of rural producers with small and uncertain incomes. Yield increases occur at a lower rate than before, farm product prices are falling in many areas and prices for inputs are rising. Farm profitability is under threat, while opportunities for off-farm employment are minimal in many parts of the world.

Communication Technology for Extension

In the field of communication technology, changes have been dramatic. Over the last 100 years advances have come at an ever-increasing pace (figure 5). Particularly important for rural development, because of its relative simplicity and low cost, is the digitization of information, which offers the possibility to let machines "talk" to each other. Computers in southern Sudan are connected over more than 1,000 kilometers via digital radio at very low costs. In Morocco, a computer with
Figure 5. Communication, information, and Computer Technology

Communication Technology
- Radio
- Tape Recording
- Cable TV
- Satellite
- Digital Communication
- Facsimile
- Optical Fiber
- Teleconferencing
- Personal Telephone
- Personal Satellite Links

Information Technology
- Management Information Systems
- Expert Systems
- Computer Aided Design and Manufacturing
- Biochips
- Learning Capability
- Fuzzy Logic
- Voice Recognition
- Microprocessors
- Database Management Systems
- Transistors
- Integrated Circuits
- Single Function Computers

Computer Technology

word processing is cheaper than an Arabic typewriter, and video camcorders in Turkey are a fraction of the cost and provide a much better image than 16 millimeter film cameras.

The Bank has lent considerably for information technology but we need to be careful not to duplicate. It is equally silly to invest in separate communication systems for health, education, and agriculture, as it would be to build separate roads for doctors, teachers, and farmers. James Grant, Director of UNICEF says in the Washington Post of December 19, 1991: "I am more hopeful than I have ever been in my lifetime." He goes on to say that he sees two reasons for his optimism, the end of the superpower conflict and global communication. "It takes more than vaccines, you need the same thing that led to the undoing of communism, a means to communicate." Grant cited the achievement this year of immunizing 80 percent of the world's children against childhood diseases. According to Grant the power to communicate was key to that success.

Questions about Extension

A lot of money has been invested to generate and transfer new technology. Farm productivity increased considerably, but it is difficult to prove that part of those yield increases might be attributed to extension. Indeed a major reason for underfunding extension is the difficulty to demonstrate its benefits. The international debate on extension seems at a crossroads. Part of the discussion seems to be going stale over issues of management, while at the other extreme, some are imagining different and revolutionary roles for extension, using new information technology.

Commercial advertizing uses the "five Ps": People, Product, Price, Place and Promotion. Companies like Coca Cola or Unilever certainly know their five Ps, their challenge is in achieving a cost-effective balance. Rather than making restrictive and exclusive choices, the Bank should assist governments in opening the debate on these questions:

- People: Who are the future clientele of extension? Only farmers or also others, like researchers or policymakers?

- Product: What kind of information is needed? Production only or also accounting or organizational skills for instance?

- Price: Who is going to pay, particularly for recurrent costs?

- Place: How is information transferred? For instance is the cost of staff with unreliable vehicles justified if the objectives could be reached by using new communication technology?

- Promotion: Who are suppliers of information? Public or private or a mix of the two, and who sets the conditions for them to work under?

These are not trivial questions. The problem is not that the answers are not known. More often the problem is that conclusions are reached without sufficiently considering the questions.
Issues

There appear to be five major issues: (a) a lack of common purpose; (b) a lack of accountability; (c) changes in information needs; (d) a widening clientele for information; and (e) a lack of consistency of agricultural information policies.

Lack of Common Purpose

Many extension services, particularly public services, lack a clear, joint result orientation. The symptoms are varied and differ for each country but some are fairly general (a) insufficient knowledge of farmers in terms of numbers, gender, farming systems, constraints, or opportunities; (b) a large number of different and partially overlapping extension structures; (c) unclear objectives that do not formulate their expected effects in terms of changes in farming practices; (d) weak management of scarce government resources with insufficient mutual reinforcement of extension, research, and education; (e) unfocused monitoring and habitual reporting; (f) supply-driven training programs that neglect skillgaps among staff; and (g) uncoordinated, supply-driven or untimely radio and television programs. Obviously, many of these problems are mutually reinforcing. For instance, it is very hard to monitor the effectiveness of an extension service if that service never clearly formulated its objectives.

The purpose of extension is to help the farmer to increase income. Of course that is a terrible generalization, but that is generally what the farmer wants and for which he or she may be willing to pay. However, many extension managers will answer the question: "what is your objective?" by saying that the planning foresees demonstrations to be done, courses to be given, slide shows to be prepared. There is confusion about farmers learning as an end, and extension teaching as a means. Merely showing a farmer how to clean her/his cow’s udder is not an end in itself, a higher income through better quality milk for a higher price is the objective.

Furthermore, and in particular public sector managers have different, hidden objectives that have to do, for instance, with turf defense, power maintenance, or fear of competition. It is the rule, rather than the exception, to find the hidden objectives to vary among different levels of staff; they are often reinforced by quite overt incentives like promotion and pay increases. Similarly, employing large numbers of field staff may serve primarily political or personal objectives. Private and nongovernmental services tend to focus more on the income of farmers, but do not necessarily focus on extension. That might not be a bad thing, and accountability is a key factor.

Lack of Accountability of Extension in Relation to Its Clientele

The symptoms of a lack of accountability include (a) a lack-of-fit between the needs of different categories of farmers and the advice given or messages supplied; (b) demonstrations that have limited applicability for the majority of farmers; (c) biased contact-farmer selection; (d) concentration on irrigated crops to the detriment of natural resources management, rainfed agriculture, and livestock production; and (e) bad management routines—including a lack of
encouragement, incentives, or sanctions— that go unchecked for long periods of time. These symptoms are primarily caused by a lack of farmer control over research and extension.

**Changing Information Needs**

There are vital changes in farmers’ information needs in virtually all borrowing countries. Two main reasons for this change are noted. First the success of extension: farmers know more today than one or two decades ago. Second extension managers have learned a lot too. They are generally more perceptive to changes in farmers’ needs.

Four significant shifts in information require changes in the organization of supply. These shifts are not new and they are not exclusive choices. They are expanding the present narrow definitions.

From instructing farmers on what they should do to advising them how to do better with their resources. Extension has achieved major changes in farmer behavior. Generally, extension has been successful in convincing farmers to use fertilizers on their fields, or to dose their animals against internal parasites. However, in order to increase income, farmers now need more information that helps them to decide how and when to use that fertilizer to improve their yields under their particular circumstances, or how, when, and why to treat their animals.

In other words, extension needs to move from allocative to technical efficiency, based on economic efficiency. A major limiting factor in achieving that is the quality of public extension workers. It is relatively easy to train staff to tell farmers about the advantages of fertilizer for their crops or dosing against parasites in their livestock. It is much more difficult to train that staff to be able to advise different categories of farmers on how best to use fertilizers and doses. Extension staff will need more diagnostic skills to test soils, for instance, or to recognize parasites. More technical efficiency means a more highly educated extension staff, moving from blanket recommendations toward advice for different categories of farmers. Private sector extension has shown many initiatives in this field. They consider it in their interest to provide technical advice to farmers on the best use of their products.

From an almost exclusive focus on agricultural production to providing information that increases income. Public sector extension and research have focused primarily on production only, often with too little attention to farmers’ income. To improve farmers’ income, on-farm grading, sorting, or even packaging has shown excellent results (for example, cotton grading in Burkina Faso, flower sorting in Turkey, flower packaging in Tunisia), but often receives little attention from public sector extension.

From limiting recommendations to on-farm activities to counseling on off-farm and non-farm income generating activities. Many farmers have secondary off-farm or even non-farm incomes. To improve their overall earnings, many would welcome training in rural entrepreneurship, including new skills, such as accounting and organizing. In some cases a farmer’s most urgent need for information would be how to get out of farming altogether (for example, Poland). Not many Bank supported extension services would regard the supply of such information as their task. However, Dutch farmers pay for an independent socioeconomic extension service, whose main mandate is estate planning.

From treating all information as a public good to equitable management of a mix of public and private information. Agricultural information is often considered a public good, to be generated and transferred by the public sector. This public good nature of information encourages free riders. A
private sector company selling information, separately or as part of their product, wants to avoid diffusion of that information to potential future customers without charge. Some researchers conclude that the public good characteristic of information causes market failure, manifested in the undersupply of extension services by the private sector. Therefore it is likely that the public sector will continue to have an implementing role in extension, particularly where the impact of the information provided is considered in the public interest, like soil erosion reduction, for instance.

However, in sophisticated agriculture information has an owner and is often time bound and is thus a private good. There are two major implications for extension. First at the implementation level, the role of extension shifts from (sometimes monopolistic) information supplier to public sector facilitator between private sector users and generators. Second on the policy level, strategies are needed that allow ownership of information, while encouraging its use.

An Expanding Audience

Success of agricultural development is determined partly by information. Farmers, policymakers, and researchers generate, transfer, and utilize information. Despite lofty intentions, extension tends to target farmers only. To improve rural earnings, not only farmers need information, but also researchers, educators, and policymakers.

Linkages between research, extension, and farmers have improved, but linkages with educators and policymakers are still underdeveloped. There are many examples of policymakers being underinformed or biased. In the Central African Republic, for instance, extension staff was unaware of the impact on production patterns of their own actions, while in Hungary the reasons for the apparent lack of farmers’ interest in land becoming available on dissolution of state farms is insufficiently understood.

Extension has generally not been able to authoritatively formulate the underlying rationale for farmers’ behavior, for two reasons. First extension often lacks the diagnostic and communication skills to find out and report on farmers’ actual perceptions, and second in number of countries policymakers have seldom asked for extension’s or farmers’ opinions.

Researchers often express their need for access to international networks, but that need is seldom formulated in a comprehensive, nationwide manner. Interventions are therefore often fragmented. Education needs to know the future market requirements, agriculture often is covered at higher levels only, to the detriment of vocational training for future, more sophisticated farmers, extension, and research workers. The private sector is often a valuable, but underutilized, source of information because there is no comprehensive plan that sets the conditions for the private sector to play its role.

Lack of Policy Consistency

Few national extension services and donors have formulated exact policies, objectives, target clientele, and expected output. In the absence of explicit extension policies, the debate on methods and approaches has forced choices that are frequently not articulated with the rest of the national agricultural policy environment. The result has been confusion in the minds of financiers, policymakers and extension planners over what exactly they are trying to achieve with extension.
Two main reasons often are given for present policy reorientations: concern about recurrent costs, and particularly in Eastern Europe, a move away from central planning. Extension services often been seen as general purpose policy instruments to induce or even force changes in rural life. For many policymakers it is the only, often one-way, channel of information with the farming community.

**Recommendations**

Four possible ways are suggested in which the Bank could assist in improving efficiency and effectiveness of agricultural information management: (a) shared objectives; (b) stronger accountability; (c) a systemic approach to information; and (d) comprehensive policies.

**Shared Objectives**

When the management consultants T. S. Peters and R. H. Waterman researched America's best-run companies, they found a major common feature: companywide shared objectives. An interesting example from the Netherlands illustrates this point quite well. Two distinct periods in Dutch extension can be distinguished: from the end of World War II until about 1975 and the period from 1975 until now. After the war, the government and farmers clearly had the same objective: higher income primarily through higher productivity. All policy instruments worked in the same direction: extension, education, and research, backed up by subsidies and tax breaks.

After 1975, two major problems arose: overproduction and environmental pollution. Government, under increasingly critical public opinion, changed its policies to counter these problems through production quotas and regulations of the use of chemicals. Both measures meant income reduction for farmers. The government tried to use extension to inform farmers of their changed policies and to enlist support for those policies. This placed extension workers in a very difficult position, sandwiched between their employers and their loyalty to the farmers they had been working with for years.

They did the logical thing: They continued to work with and for the farmers to rationalize production. However, at the same time they fed back to the Hague the kind of information they thought the ministry would like to hear. Toward the end of the 1980s the minister realized he could no longer trust the feedback from his own field staff. The conflicting objectives of the ministry on the one hand and the farmers and extension staff on the other, proved one more rationale for privatization of the extension service.

In many borrowing countries the assumption is that the government's objectives and those of the farmers are essentially the same, namely higher production. Still evidence shows that many extension services lack a sense of purpose, partly because there are many different ways of achieving higher production.

On a more practical level, there are five suggestions to increase a sense of purpose on the service. First many services need to know their clients better. Useful *situation analyses* have been done in Tunisia, for instance. The next step is to find out what kind of problems are important for different categories of farmers. In Baluchistan, good *diagnostic* work was the basis for adaptive
research that provided messages to be transferred by extension. Third once extensionists and researchers know the major problems and are able to provide solutions, they can do their program planning. In Morocco, an enthusiastic multidisciplinary team goes into the field to train provincial staff in planning techniques, so extension and research activities respond better to farmers' actual problems. Fourth once the extension activities have been agreed upon, the most cost-effective communication channel must be chosen in order to achieve the specific objective. Manissa in Turkey and Dera Ghazi Khan in Pakistan have subcontracted printed agricultural information to the private sector and produced videos for women farmers respectively.

The last step is getting the right staff to get the job done. A skillgap analysis is a useful tool to compare what is needed in terms of staff levels, experience, skills, and attitudes, with what is actually available. The result of this comparison is a master plan for staff training where skills are lacking, a hiring program for staff that cannot be found within the service, and a firing program for untrainable staff. Skillgap analyses are politically difficult to carry out, partly because they make so very transparent what is expected from staff, and partly because legislation might prevent government staff from being fired.

Stronger Accountability

Accountability often boils down to the extent of control farmers have over the extension service. One of the easiest ways to measure control is to determine the percentage of the budget for extension that is under direct control of farmers. There are two sets of recommendations to make the generation and transfer of information more accountable to its end users: (a) ensure farmers’ direct control over (part of) the public extension budget; and (b) privatize (part of) the extension service, under the assumption that market forces will result in supply that responds to demand. These two are not mutually exclusive. Both are probably needed, because some supply will not be created by market demand.

Two examples are chosen to illustrate the different levels of intervention farmers have by regulating part of the public sector extension budget. In Burkina Faso and Mauritania farmers provide housing for "their" extension agent. Farmers thus have the possibility to directly influence the agent's performance because they could withdraw the house if the agent does not perform, and such cases have been reported. In the United States, county constituents vote on extension budgets, thereby influencing extension planning. In areas where farmers have become the minority of voters, extension's tasks have in some cases shifted away from agricultural production toward, for instance, the promotion of "life skills." Full-time, professional farmers now depend more on private sector extension, and only 30 percent of all extension is provided by the public sector in the United States.

Decentralized and increasingly private extension services emerge as agriculture moves from subsistence toward more specialized and commercialized production. The more sophisticated agriculture becomes and the more it needs to respond to market demand, the higher the information needs. Advanced commercial farmers are ready to pay for information.

Contracts are sometimes drawn to implement extension activities. In Chile the government provides subsidy tickets to selected nongovernmental organizations (NGOs) to do extension. Government’s role is limited to setting the conditions such as coverage, substance, expected output, and minimum field visit frequencies. NGOs bid for the contract, worth presently about US$200 per farmer per year. Farmers evaluate NGO performance. New contracts may or may not be drawn for the next year, depending on the farmers' verdict. In China an elaborate system of contracts exists
around Shenyang. Part of the set of contracts, which farmers sign with extension, also relates to input supply. If farmers are successful in their production, some of their productivity gains may reach extension staff in the form of significant bonuses, decided upon by farmers, and reflecting their appreciation of the extension worker’s performance.

On the level of implementation, there are two practical ways of improving accountability. First meaningful farmer representation in the diagnostic surveys was achieved in Karnataka and Tamil Nadu, for instance, by employing an NGO that trained farmers and staff in the use of Rapid Rural Appraisal techniques. Second ensure that farmers are represented in policy setting boards. This is common, the problem is equitable representation. In some cases, the worst enemy of a lot of small farmers is one large farmer; it depends on the government’s policies about growth and equity as to who will receive the most assistance. For instance, the Bank has assisted Turkey to improve chicken production through an NGO that worked with about 3,000 small farmers rather than concentrating on a handful of very large producers.

A Systemic Approach to Information

There are three reasons for supporting a more systems oriented approach to agricultural information: (a) the changes in the information; (b) the expanding audience; and (c) the changes in the type of work the Bank does. The main questions are what is information demand? what is supply? and how can they be matched efficiently, balancing private and public sector interventions?

First production increases are only one way of improving farmers’ income. A systemic approach is needed to satisfy present needs for more technical efficiency, for better integration of farming activities, particularly for livestock and crop convergence, and to enable suppliers to get in the market. Off-farm, a systemic approach is needed, for instance, to improve assistance to farmers on grading, sorting, packing, and entrepreneurial skills.

Second development does not happen automatically once farmers are fully informed; others need information too. Policymakers, for instance, need to know about rationales for farmers’ behavior, they need to monitor policy impacts. Researchers need to maintain their international networks and educators need to keep current on labor market requirements. Private entrepreneurs need to know consumer demand and extension managers need training for trainers skills. A systemic approach would map information demand and identify critical areas for action by a mix of public and private research and extension.

It is not suggested that these "other" clients for information have not been recognized so far. Of course they have, and extension managers’ time spent on communication with peers is often more than half of their available time. However, a systemic approach would provide the opportunity to budget that time, to set objectives for those consultations so that costs and benefits will become more transparent and waste will be reduced.

Third the Bank’s areas for special interest are essentially systemic: women in development, participation, or the environment, for instance, can only be tackled in a systemic way. In addition the use of new communication technology requires a systemic look at rural information.
Comprehensive Policies

A policy sets the rules of the game for a variety of players. In extension, research and agricultural education, there has been only one major player: the public sector. Four years ago, at the 1988 World Bank Agricultural Symposium, Lafourcade noted, that the World Bank and others "tend to forget or ignore the existence of on-going research and extension activities carried out by the private companies and often neglect to look at the potential for their greater involvement."

Comprehensive policies for agricultural information are needed to respond to expanded and different information needs from a widening audience. More attention needs to be given to careful mapping of information demand and supply. A key factor is matching supply and demand through the most effective and efficient channels by balancing private and public sector roles. Setting policies is a government role, but not necessarily the exclusive domain of the ministry of agriculture.

Agricultural policies affect more people than just farmers. Farmers in many countries are decreasing in relative numbers. Political power bases for agricultural policies are no longer the exclusive realm of the farming community. The environmental movement, for instance, has claimed a say in policy matters in many developed countries. An organization like Greenpeace, with 5 million supporters in thirty countries shows some impressive statistics on extension. For instance, Greenpeace Action canvassers talk to about 40,000 people in the United States every night. Worldwide, it has forty-six offices in twenty-six countries, with about 1,000 full-time staff connected by electronic mail.

Public extension and research are no more than policy instruments of the government. If there is no policy, the instruments can easily be misused. Expectations are sometimes unrealistic. Information management cannot solve market distortions, credit crunches, or unavailability of inputs. However, information about these distortions can be transferred to those who can accomplish changes in credit or input availability.

Too often extension managers and policymakers have skipped some of the more difficult questions. For instance, it is not uncommon to see staff being trained without agreement on what that staff is supposed to do or on whether staff visits to farmers are the most efficient way to achieve a given objective. Therefore the approach taken in Eastern Europe is so promising.

The Bank supports the governments of Poland, Romania, and Hungary to decide very fundamental questions on agricultural extension, education, and research, such as why? who for? paid by whom? The scenario is as follows. The borrowers put together a task force to prepare (a) a description of the present situation of extension, research, and education with an analysis of strong and weak points of the system; and (b) a draft for an agricultural information policy. Those proposals are to be presented to a wider audience during some form of conference, to inform, agree, and seek commitment and ownership. After agreement, the task force writes a policy brief and 5-year action and investment plan.

Different donors have expressed interest in paying for technical assistance and study tours. An action plan would give them the opportunity to target their contributions in a more cohesive manner than is presently the case.

There is a question of whether or not it is possible to formulate an agricultural information policy in the absence of an overall agricultural policy. There is no easy answer, although there may be two reasons to push ahead with an agricultural information policy. One, in most Eastern European countries it is unlikely that an overall agricultural policy will be formulated in the near future. There is a noticeable reluctance to formulate any policy, for fear of reinstating too much central control. Two, the formulation of an information policy may drive the formulation of an overall agricultural policy, and proper terms of reference may set its tone.
There are two final questions about these four recommendations. The first is whether these recommendations are too sophisticated for poorer countries? The second is, assuming that governments would agree to follow these recommendations, which one would come first?

In answering the first question, the argument could be reversed. The approach taken so far, which reduces overall information needs to agricultural information, to production recommendations, to extension advice by extension workers to selected contact farmers, is rather sophisticated and certainly expensive. In Mauritania for instance, the most effective way to improve farmers’ income was not by providing production recommendations, but by introducing mechanized threshing, which cut losses from 15 to about 2 percent. There are many examples; the key element is to look at mediation between information demand and supply.

Concerning the question of what comes first, some people would argue that certain countries should first improve the accountability of the service before attempting to take a more systemic look at information or try to formulate policies. This could be countered by saying that the issues are closely related and that a good policy, based on a systems approach, would almost automatically lead to a stronger sense of purpose and to more accountability within the system.

**Where Could the Bank Invest?**

The Bank plans to invest some US$150 million annually for extension in the coming 3 years. A considerable proportion will go toward the same type of activities that have been supported so far. For instance, if the most effective and efficient way of informing and educating a particular group of farmers is through face to face contacts with an extension agent, which is likely to be needed in many types of agriculture, those agents will need housing and transport. Although the public sector will continue to play an important role in agricultural information management, the main challenge will be decentralization and the Bank’s expertise could be usefully applied there.

However, in addition to these more routine investments, the Bank could shift some of its investments away from the present public sector bias. More specifically, the Bank might consider investing in people and communication technology.

**People**

Diagnosis of farmers’ problems remains a weak area in many extension services. The employment of specialized NGOs for training in Rapid Rural Appraisal and skillgap analyses have shown positive results. Also the Bank might increase its support for institution building of existing farmer associations, and shift its support away from irrigated cash crop areas toward rural development for resource poor areas, while at the same time promoting private sector investment to take up the slack. One particular way of developing local, private institutions is to provide funds, under loans, for farmers’ study tours or for lecture circuits of relevant farmer leaders. The Bank might also consider investing more in agricultural education, because the capacity of the private sector to get involved in agricultural development primarily depends on the quality of the staff available for an attractive price.
Communication Technology

The Bank may consider shifting some of its investments from developing and transferring the message to the privately owned channels used for communication and utilization of those messages.

Keywords for future lending include (a) digitization—providing the possibility to make machines "talk" including Bank workstations with workstations in rural areas; (b) localization—improving ownership and accountability, for instance, of radio; (c) linking—by investing in obsolete satellite transponders and optic fibers, which require cross-sectoral cooperation; (d) educational science—to make use of experience gained in reactive radio programming; (e) private sector—which is rapidly expanding channels, but also providing the information itself, including the production of off-the-shelf software, (f) language training—with English training receiving a lot more attention; and (g) multiple uses of what may become "rural information centers," providing a workstation for farmers, extension staff, and local researchers to access the rest of the world for information, education, problem solving, and possibly entertainment.

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ENERGIZING THE COMMUNICATION COMPONENT IN EXTENSION: A CASE FOR NEW PILOT PROJECTS

Bella Mody*

Introduction

I was invited to talk about communication technology applications in agricultural extension around the world at this symposium. It is a challenge to review 30 years of history in 30 minutes. I find it hard to teach a graduate course on this topic every fall since the quarter is only ten weeks long. My first task then, is to set limits, so what I do say will have some depth in addition to breadth.

The topic I will address is a subset of communication technology use in agricultural information systems. This will exclude very important telecommunication and telematics applications used for administrative efficiency, telecommuting, remote office work, market information procurement, and consumer research. For example, I will not discuss Thai pineapple farmers’ use of fax machines to recruit private consultants from Hawaii. Nor will I deal with India’s indigenous development of rural automatic exchanges, in part so farmers can telephone their markets for price information to decide when to move their products for sale, or the Indian Planning Commission’s use of the satellite-based National Informatics Center Computer Network (NICNET) to collect and update data from district headquarters on a variety of sectors including agriculture.

Major determinants of communication technology use in agricultural information systems are availability of the infrastructure and the ability to pay. I will restrict myself to communication technology use in what is commonly known as extension, in presently less technologically advanced countries. I will organize my comments as follows: The first section presents my reconceptualization of extension based on three-way flows of information. The next section focuses on how communication technology can energize my restructured conceptualization of extension. I describe the potential of media-based extension, drawing on behavioral science findings that extend the limited notion of media capability found in diffusion research generalizations. I then list the roles of the private sector and the public sector in implementing systematic message design to deliver the potential of media-based extension. In the final section, I summarize my recommendations on lending to support message design for media-based extension.

Extension Reconceptualized

Worldwide investment in agriculture extension has doubled in the last decade. Global annual expenditure of over US$6 billion in 1990 was nontrivial. The Bank’s lending to extension aspects of

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* Dr. Bella Mody specializes in developing countries in the Department of Telecommunication at Michigan State University, East Lansing, Michigan.
projects exceeded US$2 billion over the last 25 years. The 1990-94 investment plans show an increased rate of investment, at some US$150 million a year (Zijp 1992). The 1989 Birkhaeuser, Evenson, and Feder (1991) review of the economic impact of agriculture extension shows significant and positive extension effect. While the evidence of significant effect on output is convincing, the evidence regarding the profitability of investment in extension from a social welfare prospective is limited. Many (for example, Jon Morris 1991, Charles Antholt 1991, and John Hayward 1987) feel that the impact of extension, in general, has been less than anticipated. The 1991 report of the Bank's workshop on agriculture technology in Sub-Saharan Africa (Graegy and Anderson 1991) concluded that research and extension have contributed to the downward spiral in agricultural productivity.

Achieving clarity on the next steps is important because every country continues to invest in extension. At least one Bank advisor has written passionately on the critical role of extension in all your "special interest areas," and its importance in reversing the vicious spiral in which lack of diffusion of new technology leads to low growth, political problems, budget cuts, and further reduction in technology diffusion. How should the organization of extension be reconfigured to live up to the need for it?

The traditional concept and practice of agricultural extension is a diffusion of innovations process from government or a commercial firm to farms and farmer training centers. In recent times the process is often called technology transfer. This is a fairly mechanical process. Following the Bank's 1990 paper called Agriculture Extension: The Next Step (Agriculture and Rural Development Department 1990), I conceptualize agriculture extension as an information service that enhances the abilities of men and women farmers to respond to old problems and meet new opportunities. To me, this conceptualization implies (a) a long-term human capital development strategy; and (b) one that targets a range of problems, experienced by the full range of farmers, marginal, small, and large.

From my own field work in Asia, Africa, and the Caribbean as a communication researcher, and from a review of the literature, it is clear to me that a restructured agriculture extension strategy must explicitly support the following:

- **A Farmer-Research-Farmer System.** The research-extension cycle must begin with the farmer rather than in the laboratory. The process must be renamed, but that is not enough. The operationalization of the process must place the farmer first and last. Axinn (1988) calls this the participatory approach to agriculture extension. Examples include the small farmer development projects in Nepal and Bangladesh, the Farmers Association of Japan, Sri Lanka's Sarvodaya Shramadan Movement, and the Basic Village Education project in Guatemala. Some hard-nosed economists might be uncomfortable in the company of advocates of grassroots democracy such as Paulo Freire, Robert Chambers, Robert Rhoades, Gordon Conway, and Paul Richards who support this emerging paradigm. Implicit in this alternative farmer first view is technology support for intensification of three flows of communication. First is horizontal communication between farmers to develop a consensus on needs and to share their own indigenous solutions, followed by communication from farmer to researcher to facilitate collaborative diagnosis and resolution of unsolved problems, and only then is it time for a restructured version of the presently dominant researcher to farmer information flows.

- **Different Strategies for Different Contexts.** The content and form of extension information must be sensitive to the range of farmer realities, personal and contextual—gender-specific, ethnic, ecological, social-structural, political, and economic. This refers to fundamental systemic change in the extension approach rather than merely its efficient management. Only a third of all extension resources are directed toward the vast majority of small and marginal farmers (Zijp 1992). I suspect a negligible proportion of extension resources are directed toward women-focused strategies in spite of their varied participation in agriculture. The pattern is not surprising because there are few women extension workers. The typical college graduate extension worker is a male professional who prefers
to spend his time with more educated male farmers who have the resources to act on the input-intensive advice he has been instructed to share. Conversations between male extension workers and women are not culturally acceptable in many societies and, therefore, occur infrequently. Radio and television programs that accurately portray and even emphasize women’s roles could help women farmers improve food production and branch out into cash crops.

**Integrated Human Development.** Multifaceted humans bring about agricultural development and national development. In addition to how-to-do-it tips, the farmer needs holistic, structural, long-term broadly reeducational information that links a variety of sectors and issues beyond the single crop that her/his extension agent may be knowledgeable about. Relevant overlapping issues such as powerlessness, vulnerability, physical weakness, and poverty interact with self-esteem, gender identity, caste, tribe, class, and culture to set mental boundaries on farmer aspirations and achievements. In addition, the farmer might also welcome information on horticulture, fisheries, forestry, contraception, and thatched roofs. Radio and television can be organized to deliver this range of expertise to complement the extension workers’ interactions.

The next section focuses on media-based extension, first its promise and then the practice. The effects of investment in extension cannot be separated from other inputs in our evaluations any more than the effects of communication programs and systems. This should force us to think logically at the conceptual stage, in terms of when, where, and how communication hardware and programming can energize extension. We must specify plausible causal connections and interconnections for particular impacts. Effects can be direct and in the short run, in terms of specific practices, or indirect in terms of enhancing the overall capabilities of the farmer over time. It would appear that both outcomes would be desirable under your 1990 policy. I discuss implementation problems under four headings: the project context, its administrative structure, media selection, and the organization of programming content.

### Media-Based Extension

#### The Promise

The use of communication technology can energize the collection, analysis, processing, and transmission of data needed by the research-extension system in qualitatively and quantitatively different ways, resulting in greater accuracy and representativeness in the portrayal of an issue, and faster presentation of facts. Audio cassette recorders and minicameras can help extensionists at the grassroots level to focus discussion among different groups of farmers on local innovation, know-how, and unresolved problems for transmission to researchers and other farmers. Radio and television stations can then be used to transmit specially produced broadly reeducational cross-sector programming and differentiated recommendations from other farmers and researchers to marginal, small, and large farmers.

The major promise of mass media has been faster extension of quality information to more farmers, especially in areas underserved by the extension service. Accurate extension of research and extension expertise via these "magic multipliers" of exposure can be designed to approximate individual and group visits from extension workers, and farmer trips to research centers and demonstration farms at a very low cost for each farmer. The benefit from low-cost outreach of the
mass media can provide the impetus for substantial sectoral reform as it did in the case of formal education in El Salvador (Mayo 1976). High-quality persuasive presentation of tips on inputs, techniques and how to economize in production and marketing has the potential to enhance farmer efficiency in technical, allocative, and innovative ways without any increases in the extension workforce.

Use of media with wide-area coverage will level differences in opportunities for exposure to extension between large and small farmers, male and female farmers, and farmers who are closer to headquarters than others. I document one way this can be done in a study I coauthored in the 1970s on agriculture extension in India (Prakash and Mody 1976).

Creative enhancement of the extension system through provision of knowledge to all farmers through the mass media should make the job of the field extension worker easier. Media programs, which feature the successes of fieldworkers, can boost morale and present role models for emulation. The radio program *The Old Lady and the JTA*, which features conversations with an extension agent, is among the most popular in Nepal. Similar to materials and messages designed to reach farmers, media channels can also carry training programs and research updates for extension workers on a regular basis. This makes it possible to hire paraprofessional field staff with high school diplomas rather than bachelor's degrees.

Specially designed media programs can also be targeted at the urban public, politicians, and policymakers to ensure that they have a continuously updated understanding of the problems of agriculture. These programs could consist of news programs, documentaries, and education through entertainment, for example, the British radio drama series *The Archers*.

Communication technology like audio cassette recorders (and video cameras if available) can be used by extensionists at the village level to document grassroots innovations, assess farmers' information needs, and establish their program preferences. Viewing of these audio and video tapes by agricultural researchers and headquarters extensionists constitutes "feed forward" or bottom-up information flows that will contribute to the development of the agenda and the program plan for media use. These tapes can also be used as inserts in subsequent broadcast programming.

**The Practice**

Two agencies which have been very active in using media support for extension in agriculture (and other sectors) because the 1960s are the Development Support Communication Branch (DSC) of the Food and Agriculture Organization of the United Nations (FAO) established in 1969 and the U.S. Agency for International Development (USAID).

DSC's very well-documented projects and communication manuals provide excellent guidance for Third World planners. The jewel in the DSC crown would appear to be the video-based community consensus development horizontal communication system it set up for the World Bank's PRODERITH in Mexico (Balit n.d.). DSC has developed innovative radio broadcasting projects in Mauritania and Chad, run video-based training in Peru and Mali, and designed successful multimedia campaigns in Bangladesh, Lesotho, and Indonesia among other countries. The results of the DSC rat eradication media campaign in Bangladesh were exceptional: the proportion of farmers controlling rats rose from 10 to 40 percent in one year against a target of 25 percent. A media campaign costing US$17,500 and rat bait costing US$23,400 resulted in 1983 wheat harvest savings of US$850,000.

USAID's projects include *Masagana 99*, a radio-based multimedia campaign that contributed to major increases in rice yields in the Philippines; the Basic Village Education experiment in
Guatemala, which demonstrated how radio could affect the pace of change; agriculture extension video training in Portugal; integrated rural development radio in Jamaica; the Liberian Rural Communication Network; and the recently completed Communication for Technology Transfer in Agriculture project. (The Clearinghouse for Development Communication at the Institute for International Research in Arlington, Virginia is a repository of documentation on USAID and other projects.)

Unesco has played a major role in promoting the development of low-cost, low-power community radio stations (in Kenya, Ghana, Tonga, and Sri Lanka) that could potentially energize agriculture extension activities (Unesco 1990). An illustration of successful international horizontal communication is the 11-year old Developing Countries Farm Radio Network in Canada. This Canadian International Development Agency-funded network receives and researches down-to-earth advice from farmers and farming experts, which it then mails out in the form of written scripts to over 700 small community radio stations around the world. These are multilateral and bilateral illustrations; there are innumerable examples of national initiatives in agriculture support communication, but we do not have time to summarize them here.

Patterns of broadcast support for agriculture extension cover a wide range. They include ongoing researcher-to-farmer broadcasting through large and small radio and TV stations (with no supplementary audience group discussions and printed materials), to broadcasts followed by organized discussion groups called radio farm forums. The agricultural programming may be restricted to spots, but in many cases, there are regular talk shows, news, documentaries, dramas, and musical medleys. Multimedia campaigns of short duration have focused on specific practices in some cases, and in others, they have aimed at general mass mobilization. The initiative for production comes from various sources: in some cases, it is the ministry of agriculture, in others, it is the government broadcasting agency, a private sector broadcaster, or a nongovernmental organization like the Catholic or Bahai churches. Financing of agricultural broadcasts has reflected the pattern of financing of the extension system.

Given the great need for information to facilitate farmer decisionmaking, and the unreasonably high expectations of mass media in the 1960s, it is not surprising that communication researchers and extensionists feel applications of mass media for agricultural development rarely worked as planned (Hornik 1988). The lack of evaluation data on most applications, uneven incomparable data on the few cases that exist, and aggregation across dissimilar projects may be partly to blame. However, most guesstimates agree that the cost for each farmer of implementing radio-based extension-of-extension is far less than the cost of expansion of the human network that would approximate the same farmer coverage. In some cases the media was the wrong tool for the job, but in most cases, the problem was implementation too.

Specific implementation issues that need attention are related to the context of the project, its administrative structure, media channels, and agricultural content.

Context

The media work within the organizational context that deploys them. When media are commissioned by the extension system to carry its messages, their use is influenced by the external politics, which affect the extension system, and the internal politics of the system itself. Like commercial advertisers of goods and services who use communication technology to carry the clients' "message" agricultural extensionists and technology transfer specialists conceptualized communication similarly. They adopted the same one-way information-transfer strategy. In fact, this practice was promoted by academics who were hailed as pioneers.
In 1962, Everett M. Rogers wrote the *Diffusion of Innovations* based upon a linear model of communication, defined as the process by which messages are transferred from a source to a receiver. In 1964, Wilbur Schramm wrote *Mass Media and National Development* for Unesco. Mass media were "major multipliers" that would extend the reach of experts and extension staff to remote areas of a country. Although advertising and present agricultural extension systems are both based on top-down information transmission, the process, the production values, and the impacts of the two are quite different. The reasons are not hard to find, but they are not made explicit anywhere. Advertising agencies receive big budgets to do audience research and hire the most creative production talent to persuade clearly defined audience segments with purchasing power to generally make a relatively small change in their consumption habits (for example, switch from one brand of toothpaste to another).

For the most part, agriculture extension's use of media is characterized by low budgets, little or no audience research prior to and during program development, production by jaded government-issue artists whose creativity has been killed by the precedent-oriented bureaucracy, undifferentiated audiences, and the impossible goal of persuading low-income farmers to make major changes in their historically rooted family agricultural practices in the short run. When such media programs produced by agriculture departments (and their sister agencies in health, nutrition, and family planning) did not work, the privatization-inspired recommendation was to parallel the media production practices of commercial advertisers more closely, thus leading to what we now call "social" marketing campaigns. The fundamental one-way information transmission context of media use in agriculture extension has remained the same and will remain unquestioned as long as agriculture extension continues to define itself narrowly in terms of adoption of innovations prescribed on high.

**Administration**

The administrative structures of the classical agricultural extension system, its crop-specific variants, and their more efficient incarnations are modified versions of colonial bureaucracies in the developing countries. The bureaucracies of Eastern Europe and the former Soviet Union await modification. Note the irony: innovation-resistant bureaucracies are expected to promote adoption of innovations among farmers. The historical structural rigidities of large top-down agriculture extension systems cannot accommodate the flexibility required to administer local farming system-based recommendations, or participation by farmers in selecting extension-communication content. Thus, when farmer-first orientations are mandated, they are distorted and adapted out of recognition by the innovation-resistant structure.

A prerequisite for farmer-first communication design is farmer-first extension design. The functional organization of a farmer-first communication subsystem in agriculture extension requires the following three areas of expertise and training:

- **Formative research for message design**—this consists of the development of audience profiles of farmers, assessment of their information needs, audience segmentation, and pretesting of draft messages and materials in their formative stages. Existing extension staff could be trained in these tasks (Mody 1976).

- **Subject matter specialists in the extension agency**—they will analyze the audience data to develop alternative problem-solving recommendations tailored to each farmer segment. They will then prepare program specifications for media planners and producers.

- **Media planners and producers in private and nongovernmental organizations**—they are the creative artists. They select media combinations and design messages in response to the measurable objectives for each audience segment set by the agriculture extension agency.
Extension communication is envisaged as a team activity encompassing public and private sector roles. Large bureaucracies run by historical precedent are generally incapable of producing the creative communication design required to attract and hold audience attention. Table 1 charts the roles of the private and public sectors as extension-communication team partners working in participatory farmer-first production modes.

Media Channels

In the first flush of excitement in the 1960s that saw mass media as "magic multipliers" of messages (Lerner 1958), little attention was paid to the content or the innovations that would be multiplied. Political scientists, sociologists, and psychologists who studied mass communication automatically assumed the content of newly introduced media channels in the developing countries would be supportive of national development, and that exposure to these magical channels would automatically lead to what was then called "modernization." The general finding after 10 years of media support for development projects in the mid-1970s was no different from the developing countries' experience with other development projects: very little real development occurred by just about any standard, and what little occurred accrued disproportionately to the better-off segments of society (Rogers 1976). The preoccupation with the technological fix had displaced attention from essential issues of which farmers had access to the media and who controlled its content.

The same mistake continues to be made frequently today: the more expensive technological component gets all the attention, while the programming and beneficiaries for whom it is designed are neglected. I remember writing an article 15 years ago called Media for Development - But What Messages? after working for 5 years on the first application of direct broadcast satellites for agricultural extension in the developing countries. In spite of documented lessons from previous development-support communication projects around the world, the rigid division of labor between government departments and bureaucratic inflexibility in the older ministries doomed the Satellite Instructional Television Experiment in India to repeating historical errors. Activity on project hardware started 5 years before the launch of the project; television program content specifications and program production activity started only a year before. Eighty-two percent of project costs was spent on the hardware and only 9 percent was spent on the software. Advanced systematic hardware planning resulted in a project that demonstrated great technical efficiency, and the need for greater attention to programming and program utilization by fieldworkers (Mody 1978).

Diffusion of innovations generalizations about mass media that have become part of extension folklore perpetuate this channel-centric perspective (Rogers 1983). The World Bank (1990) Next Step document is an example. Message design research in the behavioral sciences tradition (summarized in the following section on media content) has made many of the limitations of media perceived by diffusion researchers questionable. Not one of the diffusion generalizations about mass media addresses the power of media programming experienced by the concerned parent, the Sesame Street fan, and adult education planners.

Diffusion generalizations show past practice aggregated across very different agricultural systems with varying uses of media. They are not specifications of conditions for optimum media use nor should they be read to mean that media use will lead to mere awareness, no in-depth knowledge, and no adoption.

To lenders who ask whether television is better than radio for agricultural extension, the behavioral science research says clearly: audiences learn from all media channels. Given availability of media channels that reach farmers, the choice of media channel should depend on the nature of the informational or instructional task (audio, visual or text, color-relevant or not, one-way or two-way,
### Table 1. Public and Private Roles of Team Members in Farmer-First Extension-Communication Systems

<table>
<thead>
<tr>
<th>Activity</th>
<th>Primary Responsibility</th>
<th>Collaborative Responsibility</th>
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<tbody>
<tr>
<td>1. Farmer-related</td>
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<tr>
<td>1. Annual study of lifestyle and media habits of farmers for</td>
<td>Field extension workers trained in</td>
<td>Writers and producers in media</td>
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<tr>
<td>audience segmentation and selection of production formats</td>
<td>formative research for media</td>
<td>production agency outside government</td>
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<td></td>
<td>program development or agrosocial</td>
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<td></td>
<td>research firm outside government</td>
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<tr>
<td>2. Annual study of information needs of farmers in each audience segment</td>
<td>Subject specialists</td>
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<tr>
<td>(using video camera and audio cassette recorders when available).</td>
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<tr>
<td>3. Preparation of annual media and message design specifications</td>
<td>Field extension worker-formative</td>
<td>Media production agency outside</td>
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<tr>
<td>handbook that lists audience segment measurable goals, and content</td>
<td>researcher and relevant agriculture</td>
<td>government</td>
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<td>per program per audience segment</td>
<td>subject specialists</td>
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<tr>
<td>4. Selection of media mix</td>
<td>Media agency outside government</td>
<td>Field extension worker-formative</td>
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<td></td>
<td></td>
<td>researcher</td>
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<tr>
<td>5. Finalization of creative strategy for series of media materials</td>
<td>Media agency outside government</td>
<td>Field extension worker-formative</td>
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<tr>
<td>production</td>
<td></td>
<td>researcher</td>
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<tr>
<td>6. Development of pilot approaches and draft message for audience</td>
<td>Media agency outside government</td>
<td>Field extension workers-formative</td>
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<tr>
<td>pretesting</td>
<td></td>
<td>researchers, subject specialists</td>
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<tr>
<td>7. Audience pretesting for attention, comprehension and action-eliciting</td>
<td>Field extension worker-formative</td>
<td>Media agency outside government</td>
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<tr>
<td>potential</td>
<td>researcher</td>
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<tr>
<td>8. Modification in media mix and message design approaches for final</td>
<td>Media agency outside government</td>
<td>Extension workers</td>
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<td>production</td>
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</table>
9. On-going process evaluation of audience exposure during dissemination

10. Biannual summative evaluation of media message impacts

II. Politicians and policymakers

1. Annual study of agriculture-related perceptions and media habits

2. Preparation of annual media and message design specifications handbook for policymakers that lists the audience segment, goals, and content

3. Selection of media mix, creative strategy for media series, and development of draft messages for audience pretests

4. Audience pretests

5. Modification of media mix and message design approach for final production

6. On-going process evaluation and annual summative evaluation

III. General public

The process will be similar to the steps followed in communication attempts with policymakers.
group or individual reception, and so on), the information-processing ability of the specific audience segment, and the financial and organizational ability of the extension system.

Media channels are only one aspect of society, and are proposed here as one energizing component of a restructured agriculture extension system. Media programs have been effective as catalysts, pivots, and accelerators of larger social or political change effort involving many forces, as in the fall of Marcos in the Philippines and "Baby Doc" Duvalier in Haiti.

**Media Content**

The benefits of media use have been suboptimal because the *program* content was designed (a) without farmer involvement; and (b) without creativity. The greatest advantage can be derived from the use of communication technology in support of agriculture extension when (a) its content and format are based on audience needs and media preferences; (b) its content is transmitted through a combination of media; and (c) its content is planned in collaboration and coordination with field extension activities and other inputs.

Each of these three conditions is related to content, the software not the channels or media hardware. The audience must participate with extensionists in selecting content they need for goal-oriented communication design. Because every medium has its strengths and limitations, the extensionist who is committed to supplying farm audiences with content that meets their needs will rely on a combination of channels, interpersonal, group, and mass media. Media content must be coordinated with the total extension schedule. The keywords are participatory, combinatorial, and collaborative content specification.

Because the largest amount of research on media message effects has been done in the United States, we circumspectly review what most U.S. media effects researchers generally hold to be true in our quest for insights applicable to agriculture extension applications in distinct developing country settings (Robert and Maccoby 1985). As the political and economic situations of societies change, their media uses change too, and their effects on audiences. Thus behavioral science generalizations about media effects from the United States of America, or Japan must be pilot tested before they are used in Kenya, Nigeria, or Pakistan.

Adults and children can and do learn from all media. Learning from media messages usually takes place through changing what we know (that is, cognitions). Cognitions, in turn, influence attitudes and behaviors. Audience members of higher socioeconomic status acquire information about media messages at a faster rate than audience members of lower socioeconomic status. Thus the knowledge gap between the two groups increases, unless special measures are taken to prevent this from happening.

Media messages can provide knowledge about people and places that audiences cannot see or visit. Visual media messages can explain abstract principles by illustrating them in concrete terms. Some media are better able to do this than others. Media materials can give prestige and status to people, for example, fieldworkers, and occupational activities, such as agriculture. The media can focus attention on issues that audiences should think about--the media set the agenda. How audiences interpret media messages and what actions they take depends on the particular audience group. The effects of extension messages depend on the *audience*, not on the volume of media programs transmitted by bureaucratic fiat.

Media messages can be a powerful factor in the development of audience attitudes and behaviors on topics where they know little and have no strongly held attitudes or where behavior patterns exist. However, changing existing attitudes is more difficult. Modeling theory, adapted from Bandura's social learning theory, is useful for the extension agency that wants to change traditional patterns. To change a particular kind of behavior (for example, landlords hiring organized gangs to
beat landless labor into submission), a media organization following Bandura’s theory would frequently "model" (portray) preferred alternatives (for example, dialogue) for coping with conflictual situations.

The intended audience segment (that is, large landlords) must perceive these presentations as locally viable, profitable ways to deal with the situations that previously caused them to resort to violence. If the large landlord sees the preferred behavior "modeled" in media messages on many occasions, the assumption is that she or he will imitate the theoretically preferable behavior in a relevant personal situation. If the modeled behavior proves useful in coping with the situation, the large landlord will feel rewarded for trying this new alternative and will repeat it.

Further exposure to media portrayals of the same alternative are needed to remind landlords to use the same behavior again. With repeated use, the new behavior becomes the viewer’s habitual way of handling that type of situation, unless it ceases to be effective and rewarding. The theory does not promise extensionists that farmers will immediately and uniformly imitate all the prosocial behaviors they present on television and in films. Whether imitation may come later, with the new behavior slowly becoming a part of the farmer’s repertoire, will depend on the appropriateness of the alternatives that the production team suggests, the frequency with which they are presented, and the number of times the farmer tries them and finds them useful.

Acting alone, like the constant drip from a faucet that stains a washbasin over time, consistent media portrayals on selected themes can affect ideology, values, and world view of farm audiences in the long run. I would commend television and radio drama serials that continue from year to year, portraying farmers accurately, dramatically, and positively to catch the imagination of the urban public and national policymakers, in addition to special series for farmers. The constant orchestrated use of words, images, and themes in print and electronic media do shape the way audiences come to view their world. George Gerbner and his colleagues on the Cultural Indicators project in the Annenberg School of Communication at the University of Pennsylvania assert that the more an audience views television, the more its view of social reality will reflect televised portrayals. Definitions of reality and changing social norms are transmitted by mass media programs. There is consistent evidence that children and adolescents who view televised portrayals of violence demonstrate more delinquency, fighting, and parent-child conflict. Thus, constant exposure to a particular kind of media content can create an environment supportive of the values it epitomizes.

Audiences are not passive internalizers of media messages. Whatever the media presents is modified by the prevailing cultures of class, race, and gender. Partial acceptance, reinterpretation, and sometimes outright rejection of the planned meanings (and unplanned meanings) of messages need to be apprehended at the message pretesting stage. Effects of media messages need to be seen in a more complex manner than simple reproduction.

This section has summarized implementation issues that need to be addressed for media to live up to their promise.

Recommendations

I cannot recommend media use as a quick-fix modular addition to the prevailing top-down agriculture extension system. Media-based communication attempts are effective to the extent that their process of message design approximates dialogue in interpersonal communication (Mody 1991). The bureaucrat-to-farmer top-down structure of the existing agriculture extension edifice parallels the
old development paradigm and its parallel communication paradigm that was discarded as ineffective in the 1970s.

I recommend a **farmer-first extension and communication system** to you, to be fleshed out differently in each setting, after local pilot projects. What will be common across countries is clear accountability to farmer clients, monitored by a continuous audience research and evaluation process that may be undertaken in-house or contracted out. Crucial elements of this farmer-research-farmer extension and communication system are prior farmer to farmer horizontal flows of information, followed by farmer to researcher flows. Information may be recorded by fieldworkers on video, on audio or strictly on paper, based on budgets and farmer preferences. The bottom-up process is important, not the hardware.

Once this data is in, I recommend that an extension-communication team develop a long-term program plan that uses multiple media to focus on steps that different audience segments can take by themselves with present levels of input infrastructure and extension support. The available range of media channels to carry the specified content will vary from place to place. A review of the 1991 *Statistical Abstracts* confirms that radio is the medium of the developing countries. A radio-based dissemination strategy combined with local television or videocassette and print material (when affordable) and extension support (if available) will probably be the most sustainable agriculture extension media plan, and is perfectly adequate. It would be worth giving thought to financing 1 kilowatt television stations and low-power radio stations as multisectoral integrated rural development facilities, where they do not exist. An additional funding implication is more vehicles, some portable low-cost audio and videocassette recorders, laptop computers for rapid data analysis, and local retraining of existing extension staff as formative researchers for program development if the basic capability exists in-house.

Media planning and subsequent message design to meet agreed specifications is a specialized activity that would be best contracted out to a creative group that is also comfortable with the notion of proving their utility to farmers through systematic periodic program pretests and pilots before final production. The conduct of systematic multimethod social research and behavioral science findings can be taught; creativity in media production cannot. That creativity does not survive in large government bureaucracies is evidenced by the uninspiring quality of present agricultural media programming output. The lack of audience involvement and media producer-audience-researcher interaction results in programming that ranges from know-it-all subject experts and progressive farmers talking down at audiences to one-shot plays with no dramatic tension or cultural compatibility with farmers.

My recommendation gives central place to the extension-communication message design process. The process is farmer-based, goal-oriented, and accountable. It combines use of multiple media, and represents collaborative team production between nongovernment and government agencies with different skills. I have been personally involved in implementing this approach to communication design in the Kheda Communication Project, an on-going 1 kilowatt rural TV system in India, and in the USAID financed Jamaica Broadcasting Corporation's agriculture radio station in Mandeville (shut down in 1982 for lack of funds and then leased to a commercial broadcaster by the Seaga regime). If any of you perceive an uncanny similarity between this audience-based program development process and that pioneered by *Sesame Street*, let me stress that this is no accident. The Children's TV Workshop parented the operational model of how to design purposeful and simultaneously entertaining media programming in a parsimonious fashion.

Is the Bank ready in 1992 to experiment with pilot projects alternative to the orthodox agriculture extension and communication systems? I suspect it is almost as hard to change direction within the World Bank bureaucracy as it is within a large developing country government. Ten years ago, one of you wrote: "For a variety of reasons, Bank support for agricultural development has
focused on strengthening and expanding the orthodox agricultural extension system. But in recent years, there has been a growing awareness...that many countries are finding it increasingly difficult to cope with the recurrent costs. There have also been encouraging results from Bank research on the cost effectiveness of media...the result has been a new interest in the possibilities offered by media, particularly broadcast media...in some cases, it is also difficult to deal with such questions as media infrastructure, hardware maintenance, and manpower training on a project by project basis, and therefore a sectoral or even an inter-sectoral approach is needed...the promise offered by such approaches is too great to be ignored, particularly for lowering costs and for quickly reaching large groups of small farmers with information..." (Perrett 1982).

Ten years later, another World Bank advisor writes: "Thinking about extension in and outside the World Bank has reached a crossroads where decisions need to be made on the role of extension in the wider field of agricultural information management...it is silly to invest in separate communication systems for health, education and agriculture, as it would be to build separate roads for doctors, teachers, and farmers..." (Zijp 1992).

Could it be possible that some researchers will be here 10 years later, in 2002, saying pretty much the same thing? Thomas Kuhn (1970) suggested that our critiques notwithstanding, dominant paradigms do not pass away until the power structure and economic conditions that support them change. Criticism of the orthodox top-down extension approach is a critique of neo-classical theory as applied to agriculture. I understand that this is the basic religion here. I remember Larry Shore, a doctoral student at Stanford in the late 1970s standing in the doorway to my office saying "Old paradigms never die, they only change their clothes." You are a very intelligent group of professionals. You have a lot of data and a lot of experience. You can use global telecommunication systems to get any specialized insights you lack. As the largest donor for agricultural extension in developing countries, it is important that you decide to change the rhetoric and the reality of agriculture extension.

Sigman and Swanson (1984) reported that the fifty-nine developing country extension directors they studied ranked communication equipment among the top four problems they faced. In fiscal 1979, 1 percent of sector lending was assigned to "communication support" of agriculture projects. I don't know what proportion of the Bank's lending in agriculture is directed toward mass media activities in 1992. I suspect present uses of communication technology are relatively minor.

If you are attracted by the accountability of a farmer-first client-based extension communication system with goals evaluated through constant audience research and monitoring, the behavioral science tradition in communication has a message-design process to recommend to you.

Endnote

1. Developing Countries Farm Radio Network, Toronto, Canada.
References


NEW TECHNOLOGIES IN SOIL
FERTILITY MAINTENANCE
PRIVATE SECTOR CONTRIBUTIONS

Dennis H. Parish

General Aspects of Soil Fertility

It is generally perceived that the soil, through its various physical, chemical, and biological processes, plays an essential role in the growth of plants. This is incorrect, however, in that, given water, air, and mineral salts, plants grow perfectly well without soil. Intensive commercial vegetable production systems are based essentially on hydroponics with the soil providing mainly physical support for the plant.

This being said most crop production will continue to rely mainly on the soil as a physical, biological, and chemical environment for the plant roots with all three of these elements interacting, often in a complex way, to affect root growth and health and thereby determining the final yield of the crop. The skill of the farmer lies in his ability to eliminate soil constraints to growth and to exploit these interactions to the degree possible while practicing sound soil erosion control measures.

The Need for Plant Nutrients

Historically, the small farmers of the world have taken amazing steps in selecting crops, varieties, and cropping systems to fit their particular ecosystems. A good example is the existence of cropping systems using traditional varieties of rice that are season and period fixed and that, in the case of deep water rice, exhibit facultative elongation.

The relatively rapid spread of maize and cassava in Africa and of the potato in Europe, all of which were imported from Latin America, illustrates the constant search for newer and better crops and cropping practices and the ready adoption of useful technologies by the farming community even in the absence of formalized research and extension activities. The search for means of safeguarding and improving the soil resource base has also been the historical goal of many farmers. Extremely well-developed crop residue recycling systems, with or without an animal component, were developed in Europe and Asia in areas of high population density, and on all the continents long-term rotations and the use of wood ash and leguminous crops were features of farming in many areas. All these systems, which are rich in their variability, developed presumably as a response of the farmer to his environment and from a sense of stewardship. Unfortunately, population pressure is causing the

* At the time this paper was presented Dennis H. Parish was Director, Resources Management Research and Development Division, International Fertilizer Development Center (IFDC). Muscle Shoals, Alabama. He is now a private consultant.
collapse of many systems which were sustainable when population pressures were low, with consequent severe damage to the soil resource base.

The world's highly productive cropping systems capable of handling the increasing demand for food are essentially already in place. They are based on modern technologies; thus yields and profitability depend for the foreseeable future on fossil fuel-based technologies.

As with the collapse of the traditional farming systems, the pressures for increased production have caused abuses of the modern technologies, and both industry and the farmer now face the environmentalists' pressure to change. Much of this pressure is aimed at a major reduction in pesticide use and, unfortunately, also in fertilizer use. The word "unfortunately" is used deliberately; whereas pesticides are essentially synthetic organic molecules, many of which do not exist in nature, fertilizers are sources of nutrient ions that are needed by plants and that already exist in all soils.

Harwood (1990), in his review of sustainable agriculture, highlights three points on which there is universal consensus: (a) agriculture must be increasingly productive and efficient in resource use; (b) biological processes within agricultural systems must be much more controlled from within (rather than by external inputs of pesticides); and (c) nutrient cycles within the farm must be much more closed. The first point is a truism; the second point clearly anticipates that pesticide use must be and will be increasingly based on integrated pest management; and the third point highlights the whole problem of sustainable soil fertility because nutrient cycles at the field, the farm, and even at the agroecological zone level are not closed and cannot be fully closed.

Agricultural production inevitably results in the exportation of nutrients from cropped lands. Increasing populations and intensified cropping imply increased nutrient exportation. As a result, many of the world's cropped areas are in negative nutrient balance. The collapse of traditional farming systems, the increasing encroachment of agriculture into fragile environments, and the abuse of modern high-input technologies have led to serious environmental and soil degradation problems all because of the drive for increased crop production.

The scientific use of fertilizer is an essential complement to on-farm sources of nutrients, including biologically fixed nitrogen, crop residues, and manures, if a sustainable agriculture that can meet the increasing demands for food is to be achieved.

In spite of an apparent slowing of yield growth (the United States maize crop, for example), conventional technology with fertilizer and improved crop cultivars, particularly as related to pest resistance, will remain the primary source of potential growth in crop production over the next quarter of a century. The achievement of production gains will depend increasingly on appropriate knowledge and information dissemination. Beyond this time period, advances in conventional technology will be inadequate to sustain the current demand trend (Ruttan 1990).

Sources of New Technologies in Soil Fertility Maintenance

New technologies are research derived, however, it must be pointed out that agricultural research by the private sector is concentrated primarily in the more developed countries, and even in these countries there is almost a continuum of research activities from government centers to the private agricultural input companies (Pray and Echeverria 1991). This is particularly true for soil fertility research, which receives major contributions from universities and national research institutes.
Until recently, this has been the situation in the United States also; the U.S. Department of Agriculture (USDA), the land grant colleges, and the federally funded National Fertilizer and Environmental Research Center (NFREC) of the Tennessee Valley Authority (TVA) have been key players in the areas of soil fertility maintenance and improved fertilizer technology. In contrast to the United States, the major European producers did have internationally recognized agricultural research stations, for example, Jealott's Hill (ICI) and Limbergerhof (BASF). However, the main efforts of the fertilizer producers in both North America and Europe, in terms of field-level technologies, were directed toward excellent information flow and the development of brand loyalty.

Nutrient-specific "trade associations," whose objective is the commercialization of the respective nutrients, have been formed. The International Potash Institute in Basle, Switzerland, supported by potash producers in Europe and the Near East, the Potash and Phosphate Institute (PPI) in Atlanta, Georgia, supported by the American potash and phosphate industries, and the Canadian-based PPI are very active in the extension of scientific information that relates to fertilizers generally and to potash and phosphate in particular. The Sulphur Institute, in Washington, D.C., is also very active in pressing the agricultural value of sulfur.

The role of trade associations in the development of agricultural technologies is often underestimated, but there is no doubt that they bring much dynamism to information diffusion through publications, meetings, and field demonstration work.

Soil Fertility Maintenance

The key physical, chemical, and biological components of soil fertility maintenance are the following:

- Control of erosion
- Maintenance of organic matter
- Maintenance of soil physical properties
- Avoidance or the reduction of the effect of toxicities
- Maintenance of nutrients and optimization of their supply to crops.

These components will be discussed in this order with special attention to nutrients, which is the key topic. The policy and socioeconomic components of soil fertility maintenance are not addressed in this paper, but Appendix 1 draws attention to the possibility of oversimplification of problems when addressed solely in terms of private sector involvement.

Control of Erosion

All the available techniques for controlling soil losses have been applied for many years, even hundreds of years, often in a very successful way and often alongside practices that are examples of what not to do. Sound stewardship of the soil, however, is not a universal goal; the needy and the
greedy often have no interest in long-term and often low-payoff investments. In general, practical soil erosion control programs have been initiated by governments, for example, the U.S. Soil Conservation Service (SCS).

The relationship between the private sector and government is illustrated in the key role played by the private sector in effecting a major fundamental change in U.S. farming practices in the area of conservation technology (see appendix 2 for definitions).

The initial impetus to use reduced tillage methods (no-till is the extreme) was the simple economic fact that farmers knew that every trip across a field with a tillage tool represented an investment in time and dollars (AAVIM 1983). However, the 1985 Food Security Act, which makes conservation practices on certain erosion-prone land an eligibility requirement for participation in many USDA programs, put economic teeth into the developments. Forty percent of the net income for all agriculture in 1987-88 came from these USDA programs. Conservation tillage needed new equipment and new herbicide and fertilizer practices, and the farmer and the private sector generally were quick to respond to these needs (Triplett 1988).

Traditional moldboard plowing is an effective means of controlling weed, insect, and disease problems, and so the shift to reduced tillage practices tends to necessitate the use of more chemical pesticides. Fertilizer placement becomes more critical and thus leads to an increased demand for innovations in product and application equipment.

One of the key components of erosion control is the rapid establishment of ground cover in order to reduce rainfall impact on the soil surface; thus, the selective encouragement of weed growth combined with a sound herbicide application program is a practical proposition in some areas.

The latest actual figures (1990) on tillage practices based on the surveys of the Conservation Technology Information Center (CTIC), cited in No-Till Farmer (Mid-January 1991), show the following:

- Total ridge-till: 3,037,899 acres
- Total no-till: 16,861,810 acres
- Total minimum-till: 56,382,031 acres
- Conventional till: 207,742,086 acres

In 1972, only 3.4 million acres of American farmland were being no-tilled; thus progress is evident. There are problems, however, concerning the relevance of the no-till and even minimum-till technology to varying soil conditions.

The involvement of the private sector in conservative tillage development is illustrated by the fact that the CTIC, which is supported by the Soil Conservation Service of the United States and the Environmental Protection Agency, receives about one-third of its budget from the private sector. The Executive Committee of this organization draws on high-level executives from such companies as du Pont de Nemours, American Cyanamid, Allis Chalmers, and John Deere. This involvement reflects the impact that changes in tillage practices have had and will have on fertilizer and pesticide use and on agricultural equipment needs, and it also illustrates the readiness of the private sector to become involved in any activity that may affect their market position—in this case, government directives and subsidies aimed at soil erosion control.
**Maintenance of Organic Matter**

In the natural uncultivated condition, the regular addition of plant detritus that is incorporated into the soil by soil organisms leads to the development of higher levels of soil organic matter (humus), which, in turn leads to improved soil structure and improved plant nutrient and water-holding properties and greatly increased storage of soil nitrogen (N). The final level of organic matter in a soil is a characteristic of a particular soil; generally, higher rainfall increases the level while higher temperatures decrease the level.

Once a soil is cultivated, the level of the soil organic matter declines. In turn large quantities of inorganic N are initially liberated, the physical stability of the soil is reduced, and its capacity to act as a reservoir for plant nutrients and soil moisture is diminished, and, of course, large quantities of nutrients are removed in the harvest.

These are facts that account for the serious destruction of structurally fragile soils, however, for most of the productive soils of the world, these facts have been of little interest to the farmer because improved cultivation techniques combined with improved crop varieties and fertilizer use have achieved major increases in yields despite soil and organic matter losses.

Almost coincidentally, the improvements in the practice of crop residue recycling in high-yielding areas due to improved machinery have led to the situation where, with maize for example, up to 10 tonnes of dry crop residue—trash, stover, cobs, and roots—is returned to each hectare harvested. Even these high levels of organic matter return, however, have only a small impact on soil organic matter levels. Barber (1979) showed for a high-yielding maize plot that at least 6 tonnes a hectare of residues was required to maintain organic matter levels. Of particular interest in this study was the fact that roots and root exudates were shown to contribute significantly to the maintenance of organic matter levels.

The conclusion therefore must be that high soil fertility resulting in higher production of crop residues that are correctly handled in the field will help to maintain soil organic matter but often at levels below those of the soil in its natural uncultivated state.

The use of organic materials as sources of plant nutrients is well developed in many countries, and the use of biological nitrogen fixation (BNF) for the generation of soil nitrogen is also widely practiced. Figure 1 shows the breakdown of the source of the three major nutrients in the agriculture of the United States. The figure shows the overriding importance of fertilizers in high-production agriculture.

Research on soil fertility to date has been heavily oriented to the use of fertilizers as the profit maker and to type, rate, timing, and placement as important components of the efficiency of their use. However, organic manures have always been valued for their nutrient contents and have been and still are costed essentially in terms of their content of available N, P$_2$O$_5$, and K$_2$O. The value of organic manures per se in improving soil structure, cation-absorbing capacity, and so on, also has been appreciated but only as a positive bonus from their use as a source of inorganic nutrients (see table 1). In practice, with intensive animal production systems, manure becomes more of a disposal problem than a valued farm input. Similarly, with crop residues—the easiest and often a beneficial way of dealing with them is by burning, but the concern over the environment and the value of surface crop residue management in controlling soil erosion have led to major improvements in handling.
Figure 1. Additions of N, P, and K to Cropland Soils of the USA from Fertilizers and by Return of Crop Residues and Manure

Nitrogen

- Manure 6%
- Crop residues 24%
- Alfalfa BNF
- Soybean BNF
- Fertilizer 70%

Total additions 13,764 Gg

Phosphorus

- Manure 18%
- Crop residues 13%
- Fertilizer 69%

Total additions 3,204 Gg

Potassium

- Manure 13%
- Crop residues 36%
- Fertilizer 51%

Total additions 8,624 Gg

Table 1. Nutrients in Livestock Manure as Produced--Kilograms of Nutrient N, P₂O₅, and K₂O Per Animal Per Year

<table>
<thead>
<tr>
<th>Animal</th>
<th>Weight</th>
<th>N</th>
<th>P₂O₅</th>
<th>K₂O</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dairy cattle</td>
<td>450.0</td>
<td>68.0</td>
<td>28.00</td>
<td>54.00</td>
</tr>
<tr>
<td>Beef cattle</td>
<td>450.0</td>
<td>56.0</td>
<td>41.00</td>
<td>48.00</td>
</tr>
<tr>
<td>Finishing pig</td>
<td>70.0</td>
<td>11.0</td>
<td>8.60</td>
<td>8.60</td>
</tr>
<tr>
<td>Poultry</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Layers</td>
<td>1.8</td>
<td>0.48</td>
<td>0.42</td>
<td>0.25</td>
</tr>
<tr>
<td>Broilers</td>
<td>0.9</td>
<td>0.39</td>
<td>0.20</td>
<td>0.14</td>
</tr>
</tbody>
</table>

Note: Livestock waste may be more valuable as a feed than as a source of plant nutrients.


Here a point may be made that farm-level management of crop residues from high-yielding crops costs money, whereas in the low-yielding systems of the developing countries, crop residues are needed for fuel, building materials, animal litter, and so on, and have a market value. The high-yielding fertilizer using farms are therefore returning very large amounts of organic matter and plant nutrients to the soil in situ, whereas those farms that most need to return organic matter and maintain plant nutrient levels are removing everything but the stubble and roots and thus depleting both the organic and inorganic status of their soils. Simply stated, the sustainability of yields is more assured under intensive agricultural systems than under subsistence or marginal farming.

Although increased environmental pressures are ensuring a greatly improved use of organic manures, the universities and research institutes have always had sound guidelines on their correct use. The private sector plays an important role in the design of storage, transport, and field application equipment. A particularly vocal private sector also ensures that the role of organic matter management in farming is not underestimated.

**Maintenance of Soil Physical Properties**

Historically, maintaining the soil's physical properties has been of prime concern for the farmer, and the timing of tillage operations to match optimum soil moisture contents for good results is a skill all farmers have to learn. Organic manures and correct crop residue management and rotations all improve soil physical structure.

Various synthetic soil conditioners are being marketed for agricultural use; Krillium (Monsanto), a synthetic organic soil conditioner, was available in the 1950s. The improvement of soil physical conditions is essentially controlled by the farmer's skills and by the equipment manufacturer bringing in innovative developments such as the high flotation equipment to lessen soil compaction.
Avoidance or the Reduction of the Effects of Toxicities

The classic toxicity problems are the acid nature of many upland soils and the salinization of arid soils. In Europe and North America, acid soils are treated with various basic materials and, particularly, crushed limestone. Most national liming programs have been subsidized because farmers in the 1930s and 1940s were reluctant to spend money on liming. The increasing use of soil acidifying nitrogenous fertilizers has always concerned agronomists who have developed sound liming programs for most farm situations. It should be noted that attempts to develop the use of neutral or less acidifying fertilizers have been overtaken by the development of low-cost technologies for urea production. It is appropriate here to draw attention to the fact that soil acidification can be a serious problem even where nitrogenous fertilizers are not used. The acidification of ley pastures in Australia caused by the mineralization of biologically fixed nitrogen in the soil is well documented.

Private sector contractors are a major source of agricultural lime for farmers in the United States and Europe. These contractors have shown their usual ingenuity in developing transportation and distribution equipment for a profitable market. Unfortunately, in large areas of the tropics, acid and aluminum toxic soils occur far from any source of limestone. Fortunately, much progress is being made by the International Agricultural Research Centers (IARCs) in selecting and developing aluminum-resistant cultivars.

Salinization is often a result of the application of faulty irrigation technologies; again the private sector on all continents has the expertise and equipment (developed by the private sector) to prevent or reduce the adverse effects of salinity. These private sector operators have strong trade associations and federal and state support in technology development, thus ensuring that their practices are not only fully advertised but also technically sound.

Maintenance of Nutrients and Optimization of Their Supply to Crops

The Evolution of the Role of Fertilizers and Their Impact

The fertilizer industry began essentially in northern Europe during the industrial revolution—a revolution which saw the beginning of massive movements of a burgeoning population from the countryside to the cities and a consequent rapid growth in the market demand for food. The history of fertilizer use is therefore closely linked to the production of cereal crops, and to this date, wheat, rice, and maize account for most of the fertilizer consumed annually. Developments in the production technologies for these three crops have had an impact not only on the quantities of fertilizer used but also on the products used.

Before the advent of the high-yielding wheat and rice varieties and hybrid maize, the major sources of plant nutrients were legume crops and farm and domestic manures. With these farming systems, the major constraint on cereal production was the low levels of soil phosphate which, in turn, led to the early development of the commercial phosphatic fertilizer industry (1842) based on sulfuric acid and phosphate rock.

The exploitation of potash deposits in Germany (1860) followed, and potassium chloride (KCl) became an important fertilizer. Nitrogen thereafter became the key constraint to cereal
production, particularly in northern Europe where the legume crops, although essential, represented a lost opportunity to grow a cereal crop. The advent of synthetic nitrogen fertilizers in the early twentieth century led to only a slow replacement of the traditional sources of nitrogen with nitrogenous fertilizers. This slow growth in demand was due to economic factors (high cost of nitrogenous fertilizers and low cereal prices) and to the genetically unimproved nature of the cereal varieties used. At this stage of agricultural development, crop varieties available to farmers were not high-yielding and the bane of farmers around the world trying to grow higher yields of cereals was crop lodging, an affliction particularly associated with high fertility soils. For this reason, the emphasis in fertilizer use was on phosphate and potash with nitrogen being used only sparingly compared with today’s practices. Under these conditions, the use of a 1:1:1 (N:P₂O₅:K₂O) nutrient ratio was, and still is, a widely accepted practice.

Because the key crops (wheat and rice) were self-pollinating, a wide range of distinct varieties existed. The challenge, therefore, was to use the various characteristics of the different varieties to produce crops that did not lodge and that therefore could respond in terms of higher yields to higher levels of soil fertility. Breakthroughs occurred over a very short period, and yields of rice in Japan and of wheat in the United Kingdom soared.

In the United States, the major crop with the potential for rapid intensification was maize, an open-pollinated crop; it was not until the introduction of hybrid maize that yields and consequently the demand for fertilizer grew. There was a long delay in the adoption of maize hybrid technology, which was discovered in the 1930s, a period of low prices, and which took off only in the 1940s.

With the advent of cheap synthetic nitrogenous fertilizer, the world pattern of nutrient consumption changed dramatically (figure 2). Much of the rapid increase in nitrogen used was due not only to varietal changes but also to changes in cropping systems (Parish 1987). A rapid increase in nitrogen use in the United Kingdom after 1950 was mainly a result of the replacement of ley farming systems, in which clover provided the nitrogen, with all-grass pastures that responded well to nitrogenous fertilizers. In the United States the maize-leguminous crop rotation was replaced by maize monocropping and nitrogen fertilizer use increased rapidly.

The impact of the increase in world fertilizer consumption has been enormous, and without this increased use the world would have faced unprecedented levels of malnourishment and famine. The goal of sustainable agricultural growth will become a bitter irony if the use of fertilizer is reduced in an irrational fashion.

The Major Fertilizer Products

**Nitrogenous Fertilizers.** The Haber ammonia process developed by Germany before World War I is the basis of the modern synthetic nitrogen fertilizer industry. Neutralization of ammonia with acids yields ammonium sulfate, ammonium chloride, and various ammonium phosphates that became, and still are, important fertilizers.

Ammonium nitrate production developed initially because of the need for explosives, but it became and has remained a major fertilizer commanding premium prices on the world market.

Synthetic urea has been known for many years, but the lack of suitable technology constrained its production on an industrial scale; now however, it is the world’s leading nitrogenous fertilizer.

**Phosphate Fertilizers.** Internationally traded phosphate (P) fertilizers are ground phosphate rock (PR), monoammonium phosphate (MAP), diammonium phosphate (DAP), the whole range of NPK
Figure 2. Nutrient Consumption in World, 1913-87

Million Tonnes

Nitrogen (N)

Phosphate ($P_2O_5$)

Potash ($K_2O$)
materials, triple superphosphate (TSP), single superphosphate (SSP), and ammonium phosphate/sulfate. Many countries must import all of their P needs; under these conditions the economic argument for high-analysis material, as with N fertilizers, outweighs the opportunity for some flexibility in the selection of imported P products.

SSP--SSP was, by far, the most important P fertilizer for over 100 years and is still an important fertilizer. It can be produced by uncomplicated processes and equipment, and its effectiveness as a source of P is unquestioned. Also it contains calcium and sulfur, which may contribute to soil fertility, and sometimes trace elements originating from the PR. Its main disadvantage is its low analysis, about 16 to 22 percent $P_2O_5$. Because of its low analysis it is usually made in small plants located in the market area. SSP (or partially acidulated phosphate rock) may be a good choice for developing countries (and for some developed countries) that have either sulfuric acid or PR or both. This is especially true when both P and sulfur are needed for good crop growth, which is the case in many parts of the world.

TSP, MAP, and DAP--Based on phosphoric acid, these products are essentially sources of water-soluble phosphate and are therefore agronomically equivalent; their popularity over SSP is due to their lower costs per unit of P delivered at the farm. DAP is now the most important P fertilizer.

Nitrophosphates--These products, which mainly use European production technologies, are based on nitric acid. They vary in composition and in the water solubility of the P they contain. Again, cost per unit of agronomically effective P delivered at the farm should be the basis for selection.

Phosphate Rock--In some situations, direct application of finely ground PR may be the least expensive way to supply P to crops. The practice is well established in several developed and developing countries, and it is estimated that directly applied PR accounts for 4 percent of the global use of phosphate (figure 3).

Potassium Fertilizers. Potassium chloride is the standard potash fertilizer. It contains the equivalent of 60 percent $K_2O$ and thus is a concentrated source of potash. Because of the low cost of production, potassium is the cheapest commercially available nutrient and is simple to use. The current products used in the world market are shown in figure 3 (phosphate) and figure 4 (nitrogen) and the global product mix is shown in figure 5.

The main historical trend in product development has been the production of high-analysis fertilizers in order to reduce transport and storage costs, which can double the ex-factory costs of the product. The various NP and NPK products on the world markets fall into the high-analysis category.

There are many minor forms of fertilizers produced to use locally available byproducts or to meet a special local demand, and these often compete successfully in the marketplace. Significant quantities of organic fertilizers also are produced using industrial and urban waste. Japan, for example, has laws and incentives to cause industries to separate and process their waste into useful organic fertilizers. Wastes from seafood, animal, and oil seed processing industries, bark and waste wood from the lumber industry, and waste products from the synthetic fiber industry are all collected (often a disposal fee is paid by the producer of waste to the processor) and processed into organic/inorganic compound fertilizers. Today Japan produces over 1 million tonnes of organic fertilizer and more than 3 million tonnes of organic/inorganic fertilizers containing at least 15 percent of their nutrients in the organic form. These organic fertilizers are sold at premium prices in Japan to vegetable and fruit growers, ornamental specialists, and growers of other high-value crops.
Figure 3. Approximate Distribution of World Phosphate Consumption by Product

Total $P_2O_5$ consumption in 1985-86 was 33.0 million tonnes.

Total $P_2O_5$ consumption in 1985-86 was 37.8 million tonnes.

Total N consumption in 1985-86 was 70.3 million tonnes.
Total N consumption in 1988-89 was 79.0 million tonnes.

Figure 5. Estimated Current Annual World Fertilizer Production by Type (Product Basis)

NPKs 15%
(60 million tonnes)

Binary Products 6%
(25 million tonnes)

Fluids 7%
(30 million tonnes)

Straight Materials 72%
(280 million tonnes)

Source: International Fertilizer Development Center (IFDC) 1990.
The fact remains, however, that the current pattern of industrial fertilizer production is such that innovation in the next 20 years is foreseeable only in the form that the fertilizers are delivered to the farmer. It is in this area that the United States has been a pioneer.

Tailoring Fertilizer Products to Meet Farmer Needs

With the low-yielding agriculture of the 1930s and 1940s, the widespread use of manures and legume crops and the lack of detailed knowledge of crop response compounded with farmer caution meant that fertilizer use developed only slowly and quite differently in different countries. Essentially, only cash crops were fertilized and fertilizer recommendations were of the simplest order—one bag of this or two bags of that.

Given a good soil supply of phosphate and potash, nitrogen is the key yield maker; its management is becoming increasingly critical. As a general rule, all the $\text{P}_2\text{O}_5$ and $\text{K}_2\text{O}$ needed by a crop should be applied at or before planting, whereas applications of nitrogen should be made at times and rates defined by the climate, soil, and crop. Given this statement, the scope for the fertilizer industry to manufacture fertilizers exactly matched to soil and crop needs is limited, a fact which has influenced the development of fertilizer products in the form in which they are used by farmers. The current world production of fertilizers by major types given in figure 5 shows how important straight (single nutrient) fertilizers are.

The major requirement of the farmer is to have the fertilizer he needs available when he needs it, to reduce the expenses involved in storing and applying the fertilizer, and, not necessarily the most important, to have a good price. This is the basis of a competitive market. In many areas, however, such competitiveness has not developed because of governmental planning of the fertilizer market and the fact that production units are so large that the local unit often has a quasi monopoly. The United States provides an example of the impact of the private sector on the development of the fertilizer market. The changes and trends in U.S. product development described below are not universally applicable; nevertheless, with suitable modification they have had a major impact on many countries.

**Granular Compounds (NPKs).** In 1960 production of homogeneous granular NPKs was about 12 million tonnes and accounted for 52 percent of the U.S. fertilizer market. The compounds were produced by 280 small plants scattered across the fertilizer use areas.

In 1989 only thirty-seven NPK granulation plants were operating. These produced about 2.4 million tonnes out of a total U.S. consumption of 46 million tonnes of product. The remaining plants are essentially servicing areas with specialty crops. The NFERC/TVA research has helped the NPK compound industry considerably in terms of technological innovations and in product quality control.

**Dry Bulk Blends.** Dry bulk blends are produced by mixing together two or more dry fertilizer materials to obtain a mixture (blend) of the desired nutrients in a predetermined ratio and concentration. Again NFERC/TVA has been a major contributor to this technology. Fertilizers are mixed to any ratio of nutrients requested by the farmer. Costs are competitive with those of the NPK granulation plants because the major sources of phosphate, KCl, and ammonia were and still remain on the periphery of the United States while the major market for fertilizer in the Corn Belt is in the center of the country. Therefore, the cheapest way of supplying the farmers was to bring the N, P, and K products together in the use area and to produce dry blends; because of the flexibility of the
blending system, any analysis requested by the farmer could be met. This tailoring of analyses to meet farm-level demand was something that the less flexible granulation plants could not do.

It should be borne in mind that the major nitrogen source of the U.S. farmer is anhydrous ammonia, the use of which has peaked, and, increasingly, the newer nitrogen solutions. Because these liquid nitrogen fertilizers are applied separately from the dry fertilizers, most bulk blends in the United States are low in nitrogen. Another feature of the U.S. market is that bulk blends are usually mixed and spread within a few hours. Bagged blends need special precautions in production and storage. Bulk-blend technology is spreading outside of the United States. Table 2 gives the estimated world production in 1988.

Table 2. Estimated World Production of Blended Fertilizers by Country

<table>
<thead>
<tr>
<th>Country</th>
<th>Estimated Annual Production (million tonnes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>United States</td>
<td>9.0</td>
</tr>
<tr>
<td>Canada</td>
<td>3.0</td>
</tr>
<tr>
<td>Brazil</td>
<td>2.8</td>
</tr>
<tr>
<td>Ireland</td>
<td>1.0</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>1.0</td>
</tr>
<tr>
<td>Central America/Caribbean (Total)</td>
<td>0.6</td>
</tr>
<tr>
<td>Japan</td>
<td>0.6</td>
</tr>
<tr>
<td>Others</td>
<td>2.0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>20.0</strong></td>
</tr>
</tbody>
</table>

*Source*: International Fertilizer Development Center (IFDC).

**Fluid Fertilizers.** Two types of fluid compound fertilizers are recognized: Liquids, in which all ingredients are in solution, and suspensions, which are liquids containing solids that are held in suspension by an addition of a gelatinous material such as certain types of clay. Fluid fertilizers are not a new development; several references to production and use of liquid fertilizers in the early part of the nineteenth century are found in the literature. Fluids are attractive because of their flexibility in nutrient content and particularly because the even distribution of the nutrients or their precise placement is easier with liquids than with solids.

The principal materials for liquid compound fertilizers are urea or urea-ammonium nitrate (UAN) solution, ammonium ortho or polyphosphate, and potassium chloride. UAN solution usually is less expensive than solid nitrogen.

The fluid fertilizer market in the United States developed rapidly over the past 25 years, and again NFERC/TVA has carried out necessary research. Fluid fertilizers have attracted a lot of overseas attention, but the experience of one company in the United Kingdom showed them not to be competitive with mini-bulk delivered dry blends.
The U.S. Fertilizer Retail Industry

The most interesting fact about the U.S. retail trade is that it is composed of many small-scale businesses and cooperatives. The following information is taken from a survey by Hargett and Berry (1988), which showed that there were 43.8 percent privately owned bulk-blend operations, 51.7 percent cooperatives, and 4.5 percent corporations. The figures for fluid fertilizers were 80.1 percent, 12.4 percent, and 7.5 percent, respectively.

Compared with bulk-blend plants, the average annual throughput of fluid plants tends to be smaller. The mode for fluids is 1,000 tonnes and the mode for bulk blending is 1,669 tonnes; the median for fluids is 2,018 tonnes, and the median for bulk blends is 2,153 tonnes.

A basis for the economical operation of these plants is the ready availability on the U.S. market of a wide range of fertilizer products that vary in nutrient price. Careful selection of materials can be used to lower raw material costs. Research by NFERC/TVA has been very important in helping to reduce dealers' costs, and the agency has developed a computer program designed specifically for dealer use that shows the cheapest way to achieve a desired analyses product with the material available.

A total of 36.3 percent of the liquid fertilizer tonnage is custom applied, 31 percent by the dealer, and 5.3 percent by application contractors. As with the bulk blends, farmer application of liquid fertilizer is far greater than custom application by the dealer, although dealers provide the rental equipment for farmers to apply 32.2 percent of the fertilizer. The farmer applies 31.5 percent using his own equipment.

The percentage for custom-applied suspension fertilizer is higher than that for both bulk blends and liquids. Seventy-one percent of suspension mixes are custom applied, primarily by suspension dealers rather than by custom applicators. This percentage of dealer application is greater because suspensions generally require more sophisticated application equipment.

As with bulk blenders, an increasing percentage of fluid plants offer complementary services. Of liquid plants, 71 percent add herbicides, 48.6 percent add insecticides, 79.8 percent add micronutrients, and 21.2 percent add seeds to mixtures. Of suspension plants, 95.8 percent report adding herbicides, 56.3 percent add insecticides, 89.6 percent add micronutrients, and 39.6 percent supply seeds. A key point to note in the services offered is an apparent decrease in consultancy services offered and the importance of soil testing as a service.

Appendix 3 gives a summary of the USAID/BADC privatization effort in Bangladesh, which was based on the development of private sector wholesalers and retailers—a concept applied only reluctantly by the state-operated agencies involved.

The Role of Consultancy Services in the United States

Universally, it has routinely been accepted that the key moment to pass on information relevant to the use of a material is at the time of purchase of that material. Fertilizer dealers in the United States, through their trade associations or the supplier's support, are well briefed on products and their use and thus have played a key role in the education of all American farmers in correct fertilization techniques.
Fertilizer recommendations are based on soil analyses carried out by both the private sector and the universities and in an atmosphere which implies, even if it does not prove, that the best farmers always use more fertilizer than the recommended doses. It would take a very brave or foolish salesperson in this atmosphere to recommend less fertilizer than his/her associates. The predilection of farmers for using more fertilizer than the county extension agent would normally recommend is not restricted to the United States. Table 3 shows, from the results of an actual survey, that U.K. farmers consistently use more fertilizer on key cash crops than is recommended by the extension service. Even in developing countries there are many examples of excessive fertilizer use.

Table 3. Recommended and Actual Nitrogen Fertilizer Application Rates in the United Kingdom

<table>
<thead>
<tr>
<th>Kilograms Nitrogen per Hectare</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Actual (1984)</strong></td>
</tr>
<tr>
<td>Winter wheat</td>
</tr>
<tr>
<td>Spring barley</td>
</tr>
<tr>
<td>Winter barley</td>
</tr>
<tr>
<td>Potatoes</td>
</tr>
<tr>
<td>Sugar beets</td>
</tr>
<tr>
<td>Oil seed rape</td>
</tr>
</tbody>
</table>

a. Given as examples only for crops growing under average conditions.

Source: Agricultural Development and Advisory Service (ADAS), United Kingdom.

Fertilizer has been used as a cure-all for crop production problems caused by disease and moisture deficiency, and it has been used particularly to correct the continual reduction in soil fertility caused by topsoil erosion and to expand production into marginal areas.

Blame always spreads faster than praise, and fertilizer is now suffering from a negative period in public esteem because of the increasing awareness of the danger of nitrate pollution of groundwater and the eutrophication of surface waters due to the runoff from fertilized fields. It is more important than ever, therefore, to ensure that the farmer receives the best advice available as regards his crop fertilization practices and that research to improve the efficiency of fertilizer use is intensified.

The private sector in the United States is very aggressive and resents any increase in government interference in their affairs. The recent move by the Agricultural Stabilization and Conservation Service to disqualify agronomists affiliated with fertilizer firms from assisting farmers on federal cost sharing programs has raised many hackles. A response by a major farm service organization makes the point that "we have been successful not because we sold someone a bill of goods but because we have worked hard to provide objective agronomic advice."

The growing impact of environmental issues pressures the fertilizer sector to use professionally qualified consultants. Fletcher (1991) states "While the form future programs will take is uncertain, it is already clear that NO₃ contamination from agricultural activities will not be immune to the increasing public demands for groundwater protection. Those who have traditionally answered the research and information needs of agricultural production must now take into account and address the impact of practices on groundwater, and they must work with their counterparts in the
environmental agencies to design and implement programs that are compatible with the mutual goals of a sound agriculture and a sound environment. This statement clearly indicates the way that environmental concerns about nitrate contamination of groundwater will affect fertilizer use practices.

This concern, together with the increasing complexity of farm management operations, has already led to an increased farm-level demand for private consultants having recognized educational and experience levels. The American Society of Agronomy has, through the American Registry of Certified Professionals in Agronomy, Crop, and Soils (ARCPACS), given the necessary stimulus to the development of a formalized consultancy service; currently there are 505 ARCPACS registrants certified as Certified Professional Agronomists (CPAs). Of these, 213 CPAs work in industry, 77 in government, and 94 in universities, which is a good indication of the strength and role of the private sector in the pool of U.S. expertise in crop production-related areas.

With this background the USDA, through the Council on Soil Testing and Plant Analysis (CSTPA) based at the University of Georgia, is now developing a Soil and Plant Analysis Laboratory Registry, the objectives of which are as follows:

- To establish and maintain an accurate listing of those laboratories in the private and public sectors in the United States and Canada that are engaged in the analysis of soil, plant tissue, and water. The Registry will provide basic information for each participating laboratory.
- To list the analytical services provided by the laboratory and describe their capacity and capability.
- To identify the analytical resources available to assay soil, plant tissue, and water.
- To provide a means of technology transfer.
- To assist private and governmental agencies in obtaining information related to the fertility status of cropland soils and the impact of farming practices on the environment.

Soil testing and plant analyses are a major base of U.S. crop production technology, and the land grant universities have played a major role in developing the research and extension base. Beginning about 1960, however, commercial laboratories, often associated with fertilizer production units, greatly increased their activities in this area.

The Council is actively considering the following topics: (a) laboratory accreditation criteria, and (b) responses to proposed legislation concerning required soil and tissue analysis.

Environmental Concerns and the Opportunity for New Technologies

All crop cultivation practices including conservation tillage and the use of fertilizers and organic manures have beneficial effects that are accompanied by side effects in terms of nonpoint pollution. The Environmental Protection Agency (EPA) is very conscious of this fact and is preparing management guidelines that will affect farm practices (EPA 1991). The universities are increasing research and extension activities in the area of nonpoint pollution also. The major problem facing intensive agriculture today is reconciling profitability with sustainability and environmental protection.

Controlling eutrophication of surface waters due to runoff carrying highly fertilized soil and fertilizer from fields is a matter of rainfall and flood management combined with good timing and placement of fertilizers. This is a farm-level problem that good management and improved techniques
can overcome. More serious for the whole agricultural industry is the public nervousness arising from nitrate pollution of the groundwater.

The manipulation of plant nutrient levels in the soil by using organic manures and fertilizers plays a key role in crop production, but the synchronization of these levels to match plant needs over the growing period has been and still remains a challenge. The best management practices widely publicized by the Phosphate and Potash Institute, particularly, will help, but the low efficiency of fertilizer nitrogen use (often less than 50 percent of N applied as fertilizer is taken up by the crop) will remain an opportunity for the research agronomist, the farm equipment supplier, and the chemical industry.

Coating of fertilizers, for example, the TVA sulfur-coated urea (SCU), has been developed. TVA’s SCU performed remarkably well with flooded rice crops, and 60 kilograms of N as SCU equalled 90 kilograms of N from split applications of urea in yield performance (Martinez, Diamond, and Dhua 1983). To date, however, these fertilizers are so expensive that they have been used only for special purposes such as lawns.

The correct placement and timing of fertilizers will increasingly demand improved equipment to ensure efficient use of fertilizers. Maximizing efficiency of fertilizer use is an important step toward reducing any adverse environmental effects. Martinez, Diamond, and Dhua (1983) have shown that hand deep placement (10 centimeters below the soil surface) of large 1 gram to 3 gram particles of urea (supergranules) can improve the efficiency of urea N used by the flooded rice crop to the same degree that SCU does. The problem here is the difficulty in establishing the use of supergranules, which requires a linked village-level supply source and extension service system. Progress in Bangladesh in this area seems to be promising because it is based on small-scale production of the urea supergranules by village entrepreneurs who then sell directly to the farmers.

Because of the nitrate situation, the area with possibly the greatest development potential is that of nitrification inhibitors. Dow Chemical produced N-Serve in the 1950s, which found a use particularly in the Mississippi Delta cotton area where N-Serve was applied with anhydrous ammonia in the fall to help prevent nitrification of the ammonia and subsequent losses by leaching or denitrification. Up to 5,000 tons a year of the material was sold, however, it is no longer as widely used.

A new series of very powerful nitrification inhibitors has been or is being developed by the chemical industry; if these inhibitors become commercially available, they will give the farmer much more flexibility with his nitrogen fertilization programs.

Recent research has shown that controlling the ratio of ammonia to nitrate in a maize crop can lead to higher yields, and this technique has promise also (Bock 1987).

The improvement of production methodologies, distribution systems, and agronomic practices will maximize the benefits of fertilizer use while reducing any environmental impact the fertilizers may have. These improvements are very much needed.
Conclusions

Policy issues in fertilizer sector development are paramount and must be given top priority (Appendix 1); thereafter, the active role of any government in the fertilizer sector should be confined to major fertilizer production units, which if managed with private sector practices can be perfectly efficient. Additionally, and this is a very important point, government must establish a strong and enforceable legislation to control both the quality and quantity components of fertilizer sales. The farmer's confidence in his/her purchase is an essential component of all sound fertilizer marketing systems.

Large national primary fertilizer producers, whether controlled by the government or by the private sector, have functioned essentially as quasi monopolies supplying a fairly clearly delineated geographical zone. The efficiency with which they have been run has depended upon the degree of control that management has had in terms of development, raw material procurement, production planning, and most importantly, the degree of financial responsibility they have been allowed to assume. (It is of interest to recall that both ESSO and Shell were active in fertilizer production in the early 1970s, but that both later withdrew from this activity.)

At the farm level, the optimization and maintenance of soil fertility demands a well-integrated nutrient management program that must include a scientifically based fertilizer input program. Using the technical guidance that must come from a first-class research and extension base, the fertilizer producer and the wholesale and retail market operatives must cater to the needs of the farmer. It is in the latter areas—wholesale and retail marketing—that the private sector has played, and must increasingly play, a role.

For procurement, transport, and distribution, which together establish the delivered cost of the fertilizer to the farmer, the private sector, because of its flexibility and ingenuity, can outcompete successfully with any government system in terms of cost-effectiveness. It should be noted here that cost-effectiveness is not primarily a price factor because highly priced fertilizer available to the farmer as and when he needs it is more cost-effective than cheap fertilizer waiting for delivery from a warehouse.

Globally research on the need for and effective use of fertilizers is the responsibility of the national research institutes and universities, however, private sector funding of this research definitely supports and accelerates the flow of needed information.

State extension services are a tradition, but in the fertilizer field they have passed their zenith wherever a strong private sector exists. Increasingly, information, instruction, and monitoring activities initiated by the private sector have closed the links between the research worker and the farmer.
APPENDIX 1: NOTE BY DR. BALU L. BUMB, POLICY ECONOMIST, IFDC

Introduction

In assessing the role of the private sector in promoting nutrient management for soil fertility, crop production, and environmental protection, it is important to distinguish between what economists call public goods and private goods. Private goods are those commodities and services whose ownership are in private hands; whereas, public goods are those whose ownership and use cannot be controlled by a single individual or a group of individuals. Examples of such public goods are roads, highways, and irrigation canals. Likewise, education, research, and extension also fall in this category of public goods. Such goods lead to the problem of "free" riders—that is, the use of such goods by one does exclude the use by others. No private agency will therefore be interested in creating these goods because it cannot reap all the benefits of creating such goods. Hence, the creation and maintenance of such goods has to be done by the public sector or governmental agencies. On the other hand, private goods are easily tradable and therefore the private sector can take a lead in producing and marketing such goods. However, in such cases, the private sector will operate only in those areas where there is adequate incentive and profitability.

The Policy Environment

It was indicated above that the private sector participants will engage only in those activities that involve private goods and for which there are adequate incentives. However, the governmental agencies can play an important role in creating or retarding such incentives. For example, if fertilizer prices are controlled at a level that does not allow an adequate return on the invested capital and for risk taking, then the private sector will engage neither in marketing and distribution nor production and import of fertilizers. Likewise, control and tariffs will also discourage private sector participation. On the other hand, many developed countries have provided subsidies to protect domestic production of agricultural commodities. Such subsidies, if excessive, can lead to environmental damage by promoting excessive use of farm chemicals.

In other areas such as macroeconomic and trade policies, organizational and supply policies, and infrastructure and institutional development, the governmental policies and actions can have a profound impact on private sector participation. Hence, it is crucial that the developed and developing country governments should ensure that the prevailing policy environment is conducive for both private sector participation and long-term social development, especially in those areas where private profitability may result in counterproductive social development or environmental damage or both. A judicious combination of public sector support and private sector participation is essential for promoting efficient and environmentally sound nutrient management for sustaining soil fertility for crop production.
APPENDIX 2: CONSERVATION TILLAGE DEFINITION AND TYPES OF SYSTEMS

Conservation Tillage

Conservation tillage is any tillage and planting system that retains at least 30 percent residue cover on the soil surface after planting. Conservation tillage includes no-till or slot planting, ridge-till, strip-till, mulch-till (including stubble mulching), and other tillage and planting systems that meet the 30 percent surface residue requirement. Residue cover may be from meadow, winter cover crop, small grain, or row crops.

Types of Conservation Tillage

No-Till or Slot Planting. The soil is left undisturbed prior to planting. Planting is completed in a narrow seedbed approximately 1 inch to 3 inches wide. Weed control is accomplished primarily with herbicides.

Ridge-Till (includes no-till on ridges). The soil is left undisturbed prior to planting. Approximately one-third of the soil surface is tilled at planting with sweeps or row cleaners. Planting is completed on ridges usually 4 inches to 6 inches higher than the row middles. Weed control is accomplished with a combination of herbicides and cultivation. Cultivation is used to rebuild ridges.

Strip-Till. The soil is left undisturbed prior to planting. Approximately one-third of the soil surface is tilled at planting time. Tillage in the row may consist of rototillers, in-row chisels, row cleaners, and so on. Weed control is accomplished with a combination of herbicides and cultivation.

Mulch-Till. The total soil surface is disturbed by tillage prior to planting. Tillage tools such as chisels, field cultivators, discs, sweeps, or blades are used. Weed control is accomplished with a combination of herbicides and cultivation.

Reduced-Till. Any other tillage and planting system not covered above that meets the 30 percent residue requirement.
APPENDIX 3: THE BANGLADESH STORY

Bangladesh was a people's democracy in which the role of the private sector in the fertilizer sector was officially nonexistent.

In the mid-1970s the government of Bangladesh (GOB) was encouraged to reform its public sector programs. In 1978 with U.S. Agency for International Development (USAID) assistance in the form of the Fertilizer Improvement Project, the GOB opened the retail trade to the private sector and eventually into national-level procurement and distribution.

IFDC was appointed by USAID and the Bangladesh Agricultural Development Corporation (BADC), a state monopoly trading in agricultural inputs, to be the consultants for the project with IFDC consultants being posted to Bangladesh in January 1978. The following report by Surjit S. Sidhu (1991), an IFDC economist attached to the project, gives a concise account of the history, problems, and achievements of the project.

During the past 13 years Bangladesh has made significant progress in reforming its fertilizer distribution and marketing system from a total public sector monopoly to a largely competitive free marketing system through a series of policy reforms. IFDC, through its Consultancy Services, has been along with the GOB and USAID a major participant in bringing about this transformation toward a market-oriented fertilizer marketing system. This paper briefly describes various developments that have taken place and are underway to bring about the desired change of building modern agriculture in Bangladesh.

There have been severe constraints for the diffusion of technological innovations in agriculture in Bangladesh, and only moderate success has so far been achieved.

The success has not been secular. It has been a crooked road with some reversals and switchbacks. In the process, however, some hard and valuable lessons have been learned:

- Changes in policy level personnel slow progress and often cause reversals of implemented policy.
- Sustainable success requires an extended period of time.
- At the time of project start-up, the only two types of businessmen in Bangladesh were very small bazaar-type dealers and patronage business houses (fifteen to twenty) who controlled, through informal cartels, almost everything. Thus, lack of a viable mid-level business community was a serious constraint. There was a need to develop a mid-level business infrastructure and help them become a dynamic competitive free market force. This obviously required time.
- Hasty attempts to privatize the system would have resulted in turning the fertilizer marketing business over to the cartel businesses already in place, which would have been counterproductive to the development of a competitive free-market system.

As we expected, strong resistance to the policy reform objective was quick to mobilize both within the parastatal and with many government agencies.

The method of implementation has been:

- A step-by-step approach. Project papers identified the overall objective only in general terms.
- Substantial input of management and marketing assistance.
- Development of an intensive Management Information System (MIS) to monitor and evaluate results of each step and to recommend the next step in detail.
• Substantial crop production technology assistance to distributors and their customers.
• Carefully planned and very intensive effort for the training and development of fertilizer dealers.
• A substantial commercial credit facility for the private sector fertilizer business for the transfer of distribution and marketing functions from the public to the private sector.
• Incentives to the government in the form of substantial grant funds, that is, (a) US$265 million for warehouse construction; (b) US$52 million for commercial credit; and (c) US$20 million for education and training primarily in the United States.

The sequence of steps involved in the approach for technical assistance were:

• Persuade the Government to allow the dealers to buy from any sales center and sell anywhere within the country. A Technical Assistance Team made extensive field visits and encouraged dealers to move to other sales centers when the one nearest was short of supply. Some started, others followed quickly. The MIS identified the benefits.
• Close 310 Thana Supply Centres (TSCs) while expanding the capacity of the remaining 110 using USAID grant funds. Increase minimum purchase criteria. Formalize Dealer Development Training in competitive marketing techniques. Constant MIS continues to identify benefits.
• Discontinue controlled farm-level price. Allow the dealers to sell at whatever price the market would bear. This step was recommended only when we were sure dealers had a grasp of and had experienced the benefits of competition. MIS continues in place. Results of this step improved availability with almost no change in farmer price, even though decontrolled.
• Open Thana Distribution Points (TDPs) at six key low transport cost sales centers. Give a quantity related transportation discount while continuing to intensify market development activity and working closely with dealers who showed promise and the ambition to expand their network. Constant MIS identified the benefits and fertilizer availability. Lower farmer prices and technology transfer from larger distributors to farmers had started. Thus we developed an adequate number of private sector distributors with background and experience in competitive free market concepts.
• Open direct purchasing from the local fertilizer factories at the same price as the parastatal charges with a 300-tonne minimum purchase. Continue technical assistance with direct purchase distributors. Continue MIS. This results in (a) ultimate consumer price level dropped an average of TK 600/tonne x 1.5 million tonnes equal to US$26.47 million; (b) cost reduction to government equals about US$12 million (transport savings); (c) fertilizer use increased 25 percent compared to a previous 5-year average of 9 percent; and (d) record Aman harvest up 20 percent over the previous best year.
• Private sector import and elimination of all fertilizer subsidies.
• Institutionalize.

Endnotes

Traditionally, soil scientists have defined soil fertility on the basis of plant nutrient levels in the soil (Brady 1984). Young (1990) takes a much broader view, which incorporates the more recent thinking on the need for a sustainable agriculture. He, therefore, defines sustainable land use as that which achieves production while conserving the resources on which that production depends,
recognizing, however, that the most direct and primary requirement for sustainability is to maintain
soil fertility. Young then argues the following.

Soil conservation equals maintenance of soil fertility which requires:

- Control of erosion
- Maintenance of organic matter
- Maintenance of soil physical properties
- Maintenance of nutrients
- Avoidance of toxicities.

This approach widens conventional definitions even further.

In accepting Young's approach and including the environmental impact of fertilizer, it is
probably necessary to change "maintenance of nutrients" to "optimization of the supply of nutrients to
crops in terms of agronomic, economic, and environmental needs" and "avoidance of toxicities" to
"the reduction or elimination of toxicities using plant breeding and soil manipulation techniques."
These are the definitions used in this text.

Fertilizers traditionally have been defined as any organic or inorganic material of natural or
synthetic origin added to a soil to supply certain elements essential to the growth of plants (Brady
1984). With this broad definition it is usual to refer to the commercial fertilizer products of industry
as "fertilizer" and the remainder as organic fertilizers. For the purist urea is an industrially produced
organic material; in practice, however, urea is classified along with ammonium nitrate, anhydrous
ammonia, and so on, as a fertilizer.

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PUBLIC AND PRIVATE SECTOR ROLES
IN THE SUPPLY OF VETERINARY SERVICES

Cornelis de Haan and Dina L. Umali

Introduction

Poor livestock health remains one of the main constraints to livestock development in many developing countries. While global data are not available, data from individual continents and countries lead to an estimate of several billion dollars in losses in animal products caused by diseases. For example, in Sub-Saharan Africa losses because of diseases are estimated at US$2 billion per year, of which half could be attributed to direct losses due to mortality, and the other half to indirect losses through reduced growth, fertility, and work output (FAO 1985). Similarly, in Latin America, five diseases alone (hog cholera, foot and mouth disease, brucellosis, tuberculosis, and rabies) are estimated to cause losses of US$900 million annually (FAO 1990).

But the losses caused by animal diseases are not restricted to lower outputs. Diseases prevent the introduction of livestock in certain areas (for example, in Africa loss of large tracks of high potential land because of African animal sleeping sickness and the skin disease dermatophilosis) and preclude the use of more productive animals such as crossbred dairy cattle and improved pigs and poultry breeds in others. Furthermore, certain livestock diseases are directly transmitted to man, and disease control thus not only acquires economic, but also social and political importance.

Disease control services, therefore, have been, and still are, an important input into livestock sector development. Fifteen percent of the Bank’s livestock lending, or an average of about US$66 million per year, was destined over the last decade to veterinary health improvements (see figure 1). This share is particularly important in Sub-Saharan Africa, although much less in the other regions (table 1). Furthermore, in most developing countries, veterinary services consume about 60 to 80 percent of the budget allocated to livestock support efforts.

Historically, veterinary services have been the domain of the public sector and in many developing countries they remain so. This is partly a result of their original establishment as a detachment of the army to protect horses and other pack animals, and largely reinforced by the public-sector orientation in the 1960s and 1970s which viewed government as the main spur of development. Furthermore, past veterinary services were involved almost exclusively in the prevention of highly infectious diseases, which have strong public good characteristics or externalities associated with their utilization. However, more recently an increasing number of functions are carried out in cooperation with, or transferred to, private operators.

* Livestock Adviser and Consultant in the Agricultural Technology and Natural Resources Division, Agriculture and Rural Development Department of the World Bank. The authors wish to thank Gershon Feder and T. Schillhorn van Veen for their insightful comments on a previous draft of this paper.
Figure 1. Livestock Health and Total Livestock Funding in Bank Projects, 1982-91

Source: World Bank data.

Table 1. Percentage Share of Livestock Health Expenditures over Total Livestock Funding in Bank Projects by Region, 1982-91

<table>
<thead>
<tr>
<th>Region</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Africa</td>
<td>62</td>
</tr>
<tr>
<td>Asia</td>
<td>14</td>
</tr>
<tr>
<td>Latin America and the Caribbean</td>
<td>9</td>
</tr>
<tr>
<td>Europe, Middle East, and North America</td>
<td>8</td>
</tr>
</tbody>
</table>

Source: World Bank data.
This paper provides an overview of (a) the trends which spur increased privatization; (b) the economic concepts underlying the efficiency of delivery of veterinary services and that subsequently govern private and public sector roles; (c) the progress in privatization of veterinary services, including some examples of successful privatization; and (d) the future technology needs and policy requirements to facilitate privatization.

The Need for Privatization

Privatization of some veterinary services has received a strong impetus in the developing world over the last decade. Several factors contributed to this trend:

Fiscal constraints and poor management of resources have led to a decline in the operational efficiency of public sector services. The number of veterinary staff has grown faster than the means (such as vehicles and fuel, drugs and vaccines) to support them in many African and Asian countries, thus forcing the services to cut back on field activities. For example, while 33 percent of the budgets of the veterinary services of six Sahelian countries was allocated to operating expenditures in 1961-62, this share has declined to 25 percent by 1975 and to sixteen percent by 1988 (de Haan and Bekure 1991). Five countries in West Africa allocated less than 5 percent of their national livestock budget to the funding of nonsalary recurrent expenditures. While the situation in other regions may be less serious than in these Sahelian countries, the general tendency of relatively decreasing availability of recurrent funds is evident in most of the developing world.

The development of new technologies has shifted the focus from mostly herd-level prevention, which is more compatible with public intervention, to the treatment of individual animals, which is more suitable for private handling. Declining land areas for grazing due to population pressures have led to more intensive production. This, in turn, spurred the use of more capital intensive technologies, such as higher value hybrid animals, for which individual treatments are more easily economically justified. Moreover, the introduction of mass fabrication of veterinary pharmaceuticals has reduced their cost of production and subsequently their prices, making individual interventions more attractive economically.

Traditional livestock farming is shifting toward more commercialized operations. Cattle ownership is shifting from the traditional cattle-owning ethnic groups with considerable indigenous knowledge, to much less experienced commercial crop farmers in several regions of Africa and China. These commercial operations require a higher level of service. At the same time, there is an increasing awareness by traditional livestock herders of the benefits of modern veterinary medicine.

Increasing supply of veterinarians and shrinking public market. Due to fiscal contraints, governments have been forced to abandon their policy of employing all veterinary graduates. In addition, some regions (that is, the Anglophone developing world, particularly India and East Africa), have seen a proliferation of veterinary faculties resulting in an increasing supply of veterinarians. Private practice is further enhanced by the opening of opportunities to sell related products such as drugs, feeds, and farm tools. These factors contribute to the large numbers of veterinarians seeking to establish private practice.

Thus demand for veterinary services has increased strongly over the last decades, whereas public sector supply in many countries stagnated or deteriorated. At the same time a group of young graduates, all keen to establish themselves privately, has become available in many developing countries. Together these factors are generating a significant force for privatization.
Types of Veterinary Services

Veterinary services can be classified in four categories: (a) curative services, particularly the diagnosis and treatment to treat diseased animals; (b) preventive services to stop the emergence and spreading of diseases through vaccination, vector control and control measures, such as quarantine and forced slaughter of affected animals; (c) production of veterinary pharmaceuticals; and (d) human health protection, such as sanitary inspection of animal products.

Economic Principles

In assessing whether these services can be privatized, it is necessary to obtain a clear understanding of the nature of the service (Umali, Feder, and de Haan 1992). Veterinary services can be classified into four categories (table 2):

Private good. A good or service wherein the person who paid for the good or service exclusively benefits from it and no one else is able to avail of the good or service at the same time (for example, treatment of an animal's broken leg).

Private good with externalities. A private good or service whose production or consumption has spillover effects on other individuals, although the other individuals are not charged for the spillover benefits or compensated for the negative spillover effects (for example, vaccination provides spillover disease protection to animals owned by others).

Private good with moral hazard problems. A private good or service whose quality is not transparent or cannot be easily assessed (for example, vaccine quality cannot be easily evaluated).

Public good. A good or service wherein the consumption of the good or service by one individual does not reduce its availability to others and the person who paid for the service cannot exclude others from "free riding" or using the service as well (for example, food hygiene and inspection).

Following this classification, table 2 defines the appropriate sectoral distribution of responsibilities. Clinical care provided to animals is generally a private good.1 Vaccination against contagious diseases involves externalities (protection of animals belonging to other farmers and export interests), which to some extent can be internalized through government interventions. These measures may take the form of mandatory regulations such as the issuance of vaccination certificates or the subsidization of vaccinations. However, in the absence of good enforcement measures for such ex-ante controls in many developing countries, the direct involvement of the government is required either through direct provision or subcontracting to private operators. Veterinary surveillance, which ensures that proper steps are taken to avoid the spread of a highly contagious disease to other farmers, is a public good.

In vector control, the economic nature of the control measure depends on the technology used. The classical methods of vector control involve externalities (dipping) and free-rider problems (aerial spraying). More recent technology using individual herd or animal treatments, such as special screens and traps, minimize the externalities involved in their utilization and enable individual farmers to capture the benefits almost exclusively. They are, therefore, more suitable for individual management and payment.
Table 2. Economic Classification of the Types of Livestock Services

<table>
<thead>
<tr>
<th>Livestock service</th>
<th>Type of Economic Good</th>
<th>Measures to Correct for Externality</th>
<th>Moral Hazard</th>
<th>Sectoral Delivery</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Public</td>
<td>Private</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Curative</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diagnosis</td>
<td>X*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Treatment</td>
<td>X**</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Preventive</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vaccination</td>
<td>X*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vaccine production</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vector control</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tick control</td>
<td>X*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tsetse control</td>
<td>X*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Veterinary surveillance</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diagnostic support</td>
<td>X*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quarantine</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Drug quality control</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Veterinary research</td>
<td>X</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td><strong>Human health protection</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Food hygiene/inspection</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Provision of veterinary supplies</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Production</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Distribution</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* private goods with externalities; ** private good with externalities only in the case of infectious diseases; YY economically justified; Y economically justified under special circumstances.


The production of pharmaceuticals (vaccines and drugs) is a private good. Although the profits of new veterinary pharmaceuticals can be appropriated more easily, the market for veterinary medicines against specific tropical diseases in many developing countries is so small. This presents a major disincentive to research into socially desirable products by local private pharmaceutical companies. Unless international markets can be tapped (the strategy pursued by multinationals), some public sector assistance (and even from international public agencies) will be required to bridge this gap.
Economic Viability

Entry into the veterinary services market by a private practitioner will depend on whether a practice can be profitably sustained. If a favorable economic environment already exists, private profitability will depend primarily on the type of production system, the prevailing livestock density, and the extent to which economies of scale apply (Umali, Feder, and de Haan 1992). Economies of scale are highly relevant in veterinary services, because their provision involves a large proportion of fixed costs. The provision of clinical and preventive care requires veterinarians and veterinary auxiliary personnel to travel to the points of service delivery (for example, the farm, veterinary posts, or a designated stop). In such situations, the larger the number of units of service provided to clients at each point of service delivery, the lower will be the cost per unit. Specifically, the veterinarian's fee, transportation, and other transport-related costs can be spread over a larger number of animals and thus reduce the per unit cost of the service. The lower the costs, the more economically attractive they become to livestock farmers.

Because the provision of veterinary services entails significant indivisible fixed costs, veterinarians will not set up private practices unless the market for their services is large enough to sustain profitable operations. Thus, high density livestock areas will favor private sector participation, because these localities can generate a volume of demand sufficient to sustain private veterinary practice. From the farmer's perspective, this cost differential can become a screening device as to who can afford veterinary services. Farmers with large herds are better able to take advantage of veterinary services than small farmers, because their cost per unit is smaller and thus makes the services more affordable. However, small farmers can overcome this handicap through membership in producer organizations and cooperatives that provide livestock health and support services. As a result of the pooling of veterinary service needs of smallholder farmers through these organizations, they are able to take advantage of economies of scale in the delivery of the services as well as provide farmers with a mechanism for internalizing the externalities associated with some services.

Using World Bank data on the cost of establishing a private veterinary practice in Cameroon (1986), Guinea (1986), Kenya (1988), and Uganda (1990), Umali, Feder, and de Haan (1992), estimated the financial breakeven number of veterinary livestock units for traditional, semi-intensive and intensive production systems. The results are presented in table 3. They clearly demonstrate the importance of the type of production system and the importance of pharmaceutical sales on the financial viability of a private veterinary practice. To earn a minimum return of US$15,000 a year, assuming 240 trips a year and a 50 percent margin on drug sales, a veterinarian would have to treat an additional 7,600 to 13,400 veterinary livestock units (VLUs) in traditional systems and about 755 to 1,344 VLUs in the intensive systems. If it is assumed that the veterinarian travels within a 15 kilometer radius or an area of 707 square kilometers, the breakeven livestock density in Guinea will be 15.3 VLUs per square kilometer, slightly more than the prevailing livestock density of 14 VLUs per square kilometer. In such cases, auxiliaries, with much lower remuneration expectations, become attractive alternatives.

Thus privatization cannot and should not be undertaken as a broad strategy; instead a selective policy should be pursued, taking into account the economic character of each of the veterinary services and the economic feasibility of private practice. As a first step, the transfer of private good services to the private sector should be promoted. Second services that involve externalities or moral hazard problems will require some form of public intervention. Subcontracting to private operators is one option. Third choices also have to be made regarding the type of veterinary practitioner to promote. In many livestock production systems, the establishment of professional practices is not viable financially and lower cost operators such as auxiliaries need to be promoted.
Table 3. Breakeven VLUs for Private Veterinary Practice in Cameroon, Guinea, Kenya, and Uganda by Production System

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Traditional</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pure vet service</td>
<td>6,775</td>
<td>3,997</td>
<td>11,281</td>
<td>5,352</td>
</tr>
<tr>
<td>Vet service + 25% margin</td>
<td>3,413</td>
<td>3,672</td>
<td>10,500</td>
<td>4,014</td>
</tr>
<tr>
<td>Vet service + 50% margin</td>
<td>51</td>
<td>3,347</td>
<td>9,720</td>
<td>2,677</td>
</tr>
<tr>
<td>Intermediate</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pure vet service</td>
<td>1,129</td>
<td>666</td>
<td>1,880</td>
<td>892</td>
</tr>
<tr>
<td>Vet service + 25% margin</td>
<td>569</td>
<td>612</td>
<td>1,750</td>
<td>669</td>
</tr>
<tr>
<td>Vet service + 50% margin</td>
<td>NA</td>
<td>558</td>
<td>1,620</td>
<td>446</td>
</tr>
<tr>
<td>High intensity</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pure vet service</td>
<td>0677</td>
<td>400</td>
<td>1,128</td>
<td>535</td>
</tr>
<tr>
<td>Vet service + 25% margin</td>
<td>341</td>
<td>367</td>
<td>1,050</td>
<td>401</td>
</tr>
<tr>
<td>Vet service + 50% margin</td>
<td>NA</td>
<td>335</td>
<td>972</td>
<td>268</td>
</tr>
</tbody>
</table>

Note: Fees are assumed to be—traditional = US$2, intermediate = US$12, and high intensity = US$20; 240 trips a year. NA—at 50 percent margin, drug sales exceed total costs of operations.

Experiences in Veterinary Privatization

In the developed world, veterinary services are mostly privately operated. Veterinary services in these countries share several common characteristics. The government role is generally reduced to the delivery of pure public goods. This includes control over epizootics and zoonoses and food control and hygiene. Growing priority is also given to the enforcement of animal welfare legislation by the public veterinary services. Externalities involved in the control of enzootic diseases are internalized through the creation of disease control funds, financed by compulsory memberships in insurance schemes and producer organizations and special product levies. The private input supply companies (pharmaceuticals and feed) are becoming increasingly involved in extension.

In the developing world, overall progress in privatizing veterinary services has been slow. A survey of livestock specialists from the World Bank and other government agencies carried out by Umali, Feder, and de Haan (1992) showed that in only a small number of developing countries are veterinary services provided by private practitioners (table 4). The progress in Africa is noteworthy.
Table 4. Sectoral Channel for the Delivery of the Clinical and Prophylactic Veterinary Services in the Developing World 1991

<table>
<thead>
<tr>
<th>Region</th>
<th>Number of Countries in the Region</th>
<th>Partly government</th>
<th>Mainly private</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Mainly public</td>
<td>partly private</td>
<td></td>
</tr>
<tr>
<td>Africa</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clinical</td>
<td>12</td>
<td>14</td>
<td>5</td>
<td>31</td>
</tr>
<tr>
<td>Vaccinations</td>
<td>25</td>
<td>6</td>
<td>-</td>
<td>31</td>
</tr>
<tr>
<td>Latin America</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clinical</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>Vaccinations</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>Southeast Asia</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clinical</td>
<td>6</td>
<td>2</td>
<td>-</td>
<td>8</td>
</tr>
<tr>
<td>Vaccinations</td>
<td>8</td>
<td>-</td>
<td>-</td>
<td>8</td>
</tr>
</tbody>
</table>


Examples of Successful Veterinary Privatization

The Central African Republic

The Central African Republic (CAR) offers an interesting example of a private, almost exclusively user-run, animal health care system. On the one hand, the very limited number of veterinary graduates and the low livestock density impeded the establishment of profitable private professional practices; on the other hand, the high prevailing disease challenge made access to veterinary inputs highly critical. In response to the increasing demand for animal health services, two successive Bank projects have built a basic animal health care system under the auspices of the national herders organization (FNEC) which supplies producers with inputs and provides training in the use of these inputs (for a more detailed discussion refer to de Haan and Bekure 1985; Umali, Feder, and de Haan 1992). Training is provided in cooperation with drug suppliers, who finance a large part of the production of adapted training materials. Compulsory vaccinations is the only activity retained by the government.

The following discussions illustrate some of the main experiences. After veterinary drug distribution was transferred to FNEC, the sale of veterinary pharmaceuticals grew strongly, thus refuting the allegations that farmers would not be willing to purchase drugs at full cost. Veterinary pharmaceutical sales through the formal sector jumped from US$12,000 a year in 1982 to approximately US$2.1 million in 1991 (de Haan and Bekure 1991).

As a result of the development of a reliable open market system, purchases of veterinary pharmaceuticals from the black market dropped. Successive household budget surveys showed that, while in 1982, 67 percent of the farmers bought their veterinary pharmaceuticals from the black market, this percentage dropped to 18 percent in 1985 and to only 7 percent in 1988 (de Haan and
Bekure 1991). This significant drop provides a strong counter argument against restrictive distribution policies. The exclusive right of government services and professional veterinarians to distribute and administer drugs is advocated frequently by the public sector because of concern that the distribution and administration of veterinary pharmaceuticals by laymen would lead to drug resistance and adverse consequences to human health. However, recent experience seems to show that such restrictive policies lead to a much more dangerous situation of "covert" and improper use, and poses a greater danger to public health. If the official distribution system cannot provide adequate supplies, and provided that farmers are given proper education and training in the use of veterinary drugs, they should be allowed access to these drugs.

Poor herders procured relatively more veterinary drugs than the wealthier ones. Household surveys in the CAR showed that poor farmers used on average 50 percent more veterinary drugs per head than wealthier ones (Umali, Feder, and de Haan 1992). The finding that a commercial open system is more equitable than a subsidized public system is confirmed by Leonard's (1985) findings in Kenya, where he showed that the transition to a more commercial system increased the number of visits the animal health agents carried out by a factor of ten, and those visits especially benefited poor farmers. In effect Leonard found that the agents graduated their charges according to their assessment of a farmer's ability to pay, and that the poorer farmers on average paid less for the same service than the wealthier ones.

However, the CAR operation is still not completely sustainable. Although in the beginning of the program the operations of FNEC were managed strictly on a commercial basis, their success has led donors and government to try to add social objectives to the organization. First for political reasons, the input distribution system was forced to expand sales to low-density livestock areas, while obliging it to maintain uniform prices throughout its distribution network. Second donors and the government added other social functions to the organization such as literacy campaigns and range management activities, which further burdened commercial operations. Third there is a continuing tendency of public interference in the day-to-day FNEC management stemming from government's apprehension of fostering an independent power base at its side. Finally there is evidence of rent-seeking from government officials. Future strategies will, therefore, need to isolate this activity from donor and government interference.

Morocco

In Morocco the privatization of the animal health services was introduced as part of a structural adjustment program in 1985. The livestock densities in the high potential area of the country and the profitability of the intensive dairy and poultry farms permit the establishment of private professional practices. From only two private veterinarians in 1983, the number soared to seventy-six by the end of 1989 and to ninety-three by the end of 1991. Currently more than one-third of all Moroccan veterinary graduates operates in the private sector (World Bank data). They have concentrated in the high potential areas, covering about 42 percent of the country's cattle population and 30 percent of its sheep population.

Two key government policies brought about this success: (a) a policy of subcontracting some of the veterinary services to accredited private veterinarians, particularly the compulsory vaccination campaigns (these schemes account for about one-third to one-half of the private veterinarian's net income and provide essential job security to the incumbent private veterinarian); and (b) a strict government policy to curtail the provision of all curative services and the sale of veterinary inputs and noncompulsory vaccinations as soon as a private veterinarian is established in the area.
These policies have resulted in net savings for the government and improved livestock protection: (a) the average cost a head vaccinated by the public veterinary service was calculated at DH4.58 a head vaccinated, whereas the fees paid by government to private veterinarians amounted to DH3 a head; and (b) in 1989 the private veterinarians vaccinated 66 percent of the stock in their area on average, whereas the coverage of the public sector reached only 52 percent (World Bank data).

Policy Requirements for Privatization

These experiences lead to the identification of the following main policies required to bring about privatization.

Elimination of policies that promote unfair competition. Subsidized services and "moonlighting" by government veterinary agents are one of the most serious barriers to entry. The introduction of full cost recovery for private good services and supplies provided by the public sector is thus a key prerequisite for any privatization effort. Other barriers to entry, which should be eliminated, include veterinary drug import and distribution restrictions and price controls. Studies in the developed world (for example, Wise 1988), as well as indications from the developing world, show that the sale of pharmaceuticals accounts for between 30 and 50 percent of the income of a veterinary practice.

Institution of attractive subcontracting policies. Many of the public good services (meat inspection and diagnostic services) and private goods with externalities (compulsory vaccinations) can be very effectively subcontracted to private operators under government supervision.

Establishment of mutual insurance schemes and/or producer groups, to create the funding mechanisms for the control of diseases, which cannot be funded through direct payment. The creation of an autonomous fund would provide a more reliable source of financing for the payment of private subcontractors than the unreliable government budget and would, therefore, be an important feature of any privatization effort.

Establishment of the enabling legislation, adapted to the conditions of the country, which will protect and stimulate private animal health practice. This means that in those countries where the availability of private professional veterinarians and/or the nature of the economic environment constrains the establishment of private professional practices, legislative provisions should be established for auxiliary practices. Past legislation in the developing world has tended to copy the very restrictive European regulations, which reserved the right to administer most veterinary drugs to professional veterinarians.

Research and Technology Needs

Veterinary research tends to concentrate on disease control technology as such, with inadequate attention given to the capabilities of the system to deliver this technology. However, the delivery system most likely will remain poor in much of the developing world, and future control strategies and technologies, therefore, need to be tailored increasingly to fit deficient funding and poor infrastructure. This means that greater priority needs to be given to the definition of the cost-
effectiveness of the disease control measures and the development of diagnostic and control
techniques, which are low cost and can be manipulated by nonprofessional staff under poor
infrastructure conditions.

Cost-effective disease control measures can only be developed on the basis of a good
understanding of the relative importance of different diseases. This information is notoriously absent
in developing countries, and the use of cost-benefit analyses in decisionmaking concerning the
launching of a disease control campaign or moving from control to eradication policies is very rare.
Staff availability and political pressure seem to be more important criteria. A better definition of the
relative importance of different diseases in any given environment and of the economic returns to
eventual control or eradication campaigns deserves a high priority in publicly sponsored animal health
research programs.

Low-cost and easily manipulable diagnostic tools and control technologies will also be
important inputs into sustainable animal health care systems. The following exiting research is being
carried out in this area, which could revolutionize animal health care systems.

Animal side diagnostic sets. Monoclonal antibody techniques will yield simple test sets to
allow lay persons to diagnose disease types with a high degree of reliability (Winrock International
forthcoming).

Genetically resistant animals. Clearly, genetically based disease resistance is the most
sustainable form of disease control and there is increasing evidence that there is considerable genetic
resistance to several diseases, such as African animal sleeping sickness and internal parasites. Further
development of disease resistance will be assisted by the considerable ongoing research effort in
identifying genetic markers, which will allow early identification and accelerated multiplication of the
most resistant genotypes (ILRAD 1991).

User-friendly parasite control methods. Great promise is provided by the development of
screens and traps to catch tsetse flies (the transmitter of African animal sleeping sickness) and by a
new generation of pyrethroid-based insecticides with a long residual effect, which kills the flies before
they can transmit the disease. These technologies are simple to apply and their benefits accrue almost
exclusively to the owner and thus eliminate some of the free rider and spillover problems involved in
the classical methods of aerial spraying against the tsetse fly and dipping of cattle for tick control
respectively. The system of fly traps and screens, used by nomadic herders in the Central African
Republic, has been demonstrated to reduce fly population to 5 to 10 percent of their original size
(Cuissance 1989).

User-friendly vaccines. Considerable progress is being made in developing a thermostable
vaccine against Rinderpest, instead of the present thermosensitive vaccine, which requires an
expensive and difficult to manage cold chain. Similarly, the development of a thermostable vaccine
against Newcastle disease in poultry, which can be mixed in the feed (Spradbrow and Latif 1991),
removes one of the key constraints to village poultry production and is now being introduced on a
national scale in Southeast Asia. More attention still needs to be directed to the development of
multivalent vaccines, which again would significantly simplify their delivery and reduce costs.

Conclusion

A pragmatic approach to the organization of veterinary delivery services is required. First we
need to have a clear understanding of the economic importance of the disease to decide on curative
and prophylactic strategies. Second the nature of the service required will, to a large degree, determine whether private delivery will result in a socially optimal level of supply. Active involvement of government in the supervision of disease control, with private operators carrying out the actual implementation, is in many cases an attractive alternative. Third the nature of the disease and the profitability of the livestock enterprise will determine whether private delivery is economically feasible. The economic feasibility of private supply will depend on several key factors including whether professional or nonprofessional staff will be used, and to what extent economies of scale can be achieved. The promotion of producer organizations is an option. Fourth modern technological developments will have a significant impact on these choices, because they will lower costs and simplify the application of disease control interventions, and thereby increase the opportunities for private operators.

Endnotes

1. The exception is the diagnosis and treatment of infectious diseases which involve spillover effects on other animals.

2. Private sector participation will be sustainable despite low livestock densities and high per unit costs if high-value animals (for example, dairy cows and purebred horses) are involved. The high value of the animals and thus the risk of serious economic losses provides sufficient incentives for the livestock farmer to insure that the animals receive the required veterinary services (Umali, Feder, and de Haan 1992).

3. The traditional production system is characterized by smallholder/pastoralist farming and low productivity (for example, less than 500 liters of milk a year and less than 12 percent offtake), while the intermediate production system is typified by more capital intensive operations and higher productivity (for example, from 500 to 2,500 liters of milk a year and 12 to 18 percent offtake). The high intensity production system includes feedlots, ranching, and intensive dairy production; it is very capital intensive with levels of production greater than 2,500 liters of milk a year and greater than 18 percent offtake.

4. A veterinary livestock unit is an animal unit introduced to aggregate the work requirements for animal health care of different livestock species; it is equivalent to 1 cow or 1 camel or 2 horses or 2 pigs or 2 donkeys or 10 small ruminants or 100 fowl (de Haan and Bekure 1991).

References


FOSTERING A FLEDGLING SEED INDUSTRY

Alexander Grobman*

Executive Summary

A seed industry is the aggregate of plant breeding and seed research, producing, processing, and trading firms, together with seed growers and independent seed suppliers in a given region or country. In countries where a market economy has been the way of life, a purely private seed industry has emerged spontaneously and has thrived in the trading and industry traditions inherent to such an economy. Its regulation has been, as a matter of fact, directed only at consumer protection. Contrary to this system, in former colonial countries and others with strong or moderate leaning toward a centrally planned economy, a seed industry was originated by government decree as a basic and strategic state-conducted activity. The degree to which the state barred the private sector from entering the seed industry has varied from country to country, being total in the former Eastern European socialist countries and varying up to mild tolerance in some Latin American, Asian, and African countries.

While in both types of national seed systems, the mostly public and the mostly private, it has been shown that seeds can be produced and made available to farmers, there are marked differences in their comparative performance. It has been amply documented that the public systems have failed to produce sufficient high quality seed for the potential country or region demand, especially of the more difficult to produce seed categories: hybrids of maize, sorghum, sunflower, vegetable, and potato seeds. As to seeds with low propagation coefficients (ratio of seed harvested to seed quantity planted), such as the cereals, their supply has been organized mostly through the action of public seed enterprises. Nevertheless, in this area of activity of public enterprises, results have been less than satisfactory almost everywhere, both as to quantity of certified seed produced and as to its quality.

The alternative of private seed companies and seed suppliers, complementing or totally replacing former seed parastatal firms or other forms of public seed producing activities, has emerged as a strong alternative in recent years. Such private companies have emerged in the last 40 years in South America, then in the last 30 years in Mexico and Central America, and more recently in Thailand, India, and much more recently in some Asian and African countries. In some countries, where strong political decisions consonant with the support of a private seed industry were adopted, such as Turkey, a healthy and growing seed industry has developed. In other countries, a slow and halting pace of policy changes, has led to few new private entrants, because of incomplete opening of the investment climate. The few who have entered are usually foreign firms, whose losses can be written off from taxes at home, those who can globalize their business by exporting their profits as seed exports to some of their other foreign operations, those who entered into privileged monopolistic or oligopolistic agreements with government or semigovernment agencies, and those who could obtain beachhead long-term credit support on highly concessional conditions and credit guarantees from their respective governments. These exceptions, have in many new cases, excluded the local interested investors from participating in the development of their country’s seed industries. When they have, it

* Alexander Grobman is President of GENTEC in Lima, Peru.
is because the policies for promotion of the private seed industry have been consistent, clear, and wide open.

The main problems confronted by an emerging seed industry start with the lack of clear seed legislation. Because legislation is written by government officers, in the absence of representatives from the private sector, they tend to write legislation copied from those countries who have it. Invariable they accede to the most advanced western European countries, the United States, Japan, Canada, Australia, and so forth. In copying their legislation, they assume it will work. Yet it does not, simply because it is incomplete legislation. It is incomplete because those countries never had a need to change their fundamental political and business environment surrounding their seed and other agricultural-based input industries. They simply enacted the consumer protection part of the legislation. In most developing countries this becomes the entire legislation. By interpreting such regulatory legislation arbitrarily, in the absence of other organized system checks, the government is absolute ruler on decisions without recourse, and produces more often than not an environment where the subsistence of emerging seed companies leads to graft and corruption, loss of time and efficiency, and definitely poor seed quality and imperfect competition.

In order to obviate these problems two types of legislation need to be passed in countries with former socialist planning, including both the Eastern European, former colonial countries, and many Latin American countries: (a) General Seed Law; and (b) Seed Industry Investment Law. A Variety Protection Act as an annex to the General Seed Law or a chapter of it may be desirable for most countries. The legal aspects to be considered are related to the registration and establishment of seed firms; to the free transaction of business; to labor relations, especially as they pertain to the need of the industry for special seasonal labor hire authorizations, its relations with government entities; the approval and coordination of technical activities, including research and extension, variety protection, and patent treatment; and the implications of sectorial classification for the treatment of the seed industry in sectorial promotional laws. It must be understood that because some of these laws do not exist with the explicit contents indicated above in most western countries, they can be obviated in countries where a transition has taken place from a former socialist economy. Precisely because of the transition it is required that legislation be created and applied so that the roles of government and the seed industry, the organization of the national seed system, and rights of the private and public sector be made as clearly explicit as possible, because no precedents exist.

In regard to technical aspects, the seed firm must be authorized to conduct plant breeding research, if it so desires, as an inherent right, subject to no limitations. The transfer of germplasm, basic seeds, and breeding material across country borders should be authorized, subject to the usual quarantine regulations. If the seed firm has registered scientists it can be given special introductory permits for disease or pest sensitive genetic material, subject to later supervision in these specifics cases by the plant quarantine authorities. Variety testing and registration procedures need to be relaxed, reduced in time, and public service and research institutions should avoid recommending varieties, but rather allowing the market to select the best ones. Refusal of varieties should be done in cases of absolute lack of agronomic quality, disease susceptibility, or unadaptability to growth under district specific conditions.

The problem of distinction between seed certification and seed quality control, unfortunately confused in many national seed programs, ought to be clarified. Seed quality control is required on all seed classes, both certified and noncertified entering formal trade channels. A mechanism for such control and an organization in government, especially designed to protect consumers, should be established for spot checks. However, the seed firm shall be the first one responsible for developing its own seed quality control and establishing its own labels indicating seed quality according to government norms. Truth-in-labeling with the seed firm attaching quality control labels rather than the
government issuing labels is the preferred system, because it avoids logistic and administrative bottlenecks on the government side.

Seed certification is a methodology for insuring that varieties are true to type. It applies to those varieties that have been developed in public institutions. Privately developed hybrids, whose parents are coded and held in secret by the firm, cannot be certified. Privately obtained varieties can be optionally certified. Populations derived from new types of plant breeding also are unlikely to be certified. Certification is mostly done by a seed certification agency, which can be a private seed improvement association or a government agency, separate and different from the one involved in seed quality control. This is the way it is conducted in the various states of the United States, but not in many developing and socialist countries, where certification and seed quality control have been hopelessly confounded and unfortunately integrated into a single process.

Variety protection defends the right of breeders, both public and private, to market with exclusivity the varieties that they obtain in a given country, and in those foreign countries with bilateral or multilateral agreements to uphold breeders' rights. As an ever growing proportion of superior varieties of vegetables and field crops are included in the list of registered varieties receiving variety protection, their accessibility to markets, which do not recognize variety protection, is restricted, depriving farmers of their benefits. The inclusion of variety protection allows countries with emerging seed industries and good climatic conditions also to become seed producers and seed exporters for firms that may entrust seed multiplication under variety protection guarantees.

The seed business is unique in its seasonality, high inventory buildup requirement and therefore high working capital requirement relative to investment in fixed assets, and the fact that it works and sells fragile biological products. It is not a high profit industry. It is affected by external factors such as weather, internal and external commodity price fluctuations, governmental shifts and industry shifts in market promotion, and other factors. It requires at its inception initial government support for it to get organized. This support comes to new seed industries in the form of credit access and leverage, the acceptance of seed stocks as collateral at full or near full market value as seeds, kept under appropriate storage conditions, and business promotion opportunities treatment by government for a number of years after establishment.

Seed price control is a negative factor of extreme importance in a seed industry. Under conditions of a well-established market, seed price controls should be abolished. It ought to be accepted that the cost of distributing seeds is a charge to their final value, and the agents of distribution ought to participate in it with their fair share, again dictated by the market.

The expectation of economic returns in the seed industry has to be accepted over an average of several years, taking good and bad ones in a time series long enough to make calculations. Net returns on sales should average for most cases between 10 and 25 percent annually.

Credit in the seed industry for capital goods should be acceded from commercial and development bank agencies in a given country at fair or even promotional interest rates. The establishment of seed industries in most developing countries has occurred with rare exceptions at concessional interest rates. Access to credit for building inventories for the seed industry also has been promoted in many countries. Commercial banks have a tendency to lend on very short term. The seed industry requires inventories to be maintained for at least 6 months. The risk in the seed industry may also be higher than in other industries, because of the perishable nature of the seeds. Protecting inventories with appropriate storage facilities is of primary necessity; if available, seed stocks may be kept in good conditions for an average of 2 to 3 years. Other risks come from loss of seed production due to environmental hazards. Changes in cropping patterns can also affect the market for seeds that cease to be desirable.

External credit from organizations lending to the private sector often find the seed industry as defined by single companies as being too small for single loans. The International Finance
Corporation (IFC) recently has indicated willingness to lend in lower single loan blocks to specific companies. Credit organized through commercial and development banks, with specific loans from multilateral credit organizations such as the World Bank earmarked for seed and input industry development (of agricultural origin), such as the animal input industry, could be of significant support to the industry.

Promotional treatment in no or lowered import duty on capital assets or production materials has made or broken seed industry investment initiatives. The application of low tax rates, or rates similar to those applied to farmers, to the seed industry has been very effective in its initial setting up and consolidation. Remittances of profits as dividends, when accepted for guaranteed payment in hard currency out of the country is an added incentive to foreign investment for their own or joint ventures in the seed industry.

A fledgling seed industry in the private sector often finds a government parastatal organization as a competitor with great advantages, and it has to develop a subsistence and congenial attitude, but an aggressive policy for expansion of its market share. These contradictory policies always bring about clashes between the public and private sector. Nevertheless, they could be minimized with careful planning and action judgement.

Government should be interested in supporting the private seed sector. The seed industry itself needs mechanisms for a dialogue with government. This could be a national seed industry association, representing the private seed suppliers, seed firms, and traders in respective committees. This association would represent the seed industry in a national seed council, as a means to exercise a continuous dialogue, and participate in recommendations on important issues related to seeds.

**Endnote**

After these Proceedings went to press, Dr. Grobman made available a complete version of this paper. It may be available directly from him at Gentec, Apdo. 270227, Lima 27, Peru, and at some future time may be made available through the Agriculture and Natural Resources Department of the World Bank.
THE DEVELOPMENT AND MARKETING OF NEW MATERIAL FROM BIOTECHNOLOGY IN THE COMMERCIAL SECTOR

Sue Sundstrom*

Introduction

The discussion today is going to cover several aspects of plant biotechnology. I'd like to start by talking about the rationale for plant biotechnology, what it is, and why are people interested in using this type of science. Given that rationale, how much are they spending on it? What is the magnitude of the total world investment? And again why are people spending that sort of money in this area? To answer that question I think it's going to be important to look at the commercial market for seed and the impact that biotechnology is likely to have in this area.

Coming back to biotechnology itself, I want to look at the progress industry has made using this science, particularly with respect to new plant varieties and hybrids in both the Organisation for Economic Co-operation and Development (OECD) and in developing countries. Then I think it would be helpful to look in some detail at one example, and the example I know best is ICI Seeds so I will concentrate on that. Finally, I'd like to draw it all together in a conclusion: where are we now and where are we going?

Rationale for Plant Biotechnology

Recent work both in Europe and the United States has estimated that worldwide something close to US$600 million is spent a year on plant biotechnology research alone and that excludes microbes, fermentation, animal biotechnology—it's just on plant science. About half of that is public funding and half private companies. We will go into a bit more detail on the private company expenditure later. The majority of all expenditure is focused in and on markets in the OECD. That's an enormous amount of money to be spending on anything. So why do both public and private companies think it's worth spending US$600 million a year on plant biotechnology? I think there are two fundamental reasons.

The first is well-illustrated in figure 1. World population now stands at over 5 billion, mostly in developing countries. By the end of the next century conservative estimates predict that this figure will have doubled to well over 10 billion with most of the growth coming in the next 50 years. Figure 1 also amply illustrates the way that population growth rates are expected to be significantly higher in the developing countries than in the developed parts of the world. This population growth is obviously

* Sue Sundstrom is Business Strategy Manager, ICI Seeds.
Figure 1. World Population

going to result in an increasing need for a sustainable supply of food and, of course, other agricultural materials from limited land and other resources. Biotechnology is trying to help meet this need, to help maximize self-sufficiency potential in some of these countries for food in particular, but also to maximize production for export or trade potential.

The second need applies perhaps more obviously to the developed world where there is an increasing demand for quality and choice in food, other materials, and land use. And again the tools of biotechnology can help to achieve these consumer and social needs.

Investment in Biotechnology

Having explored the need for biotechnology and the purposes to which it is being put, perhaps we could look in a little more detail at private company spending on biotechnology. Twelve companies account for about one-quarter of the total US$600 million bioscience investment. Obviously these companies believe there is a need for the technology to the extent that many are spending as much or more on bioscience as they are on plant breeding. Now clearly there is a debate as to whether some techniques actually fall within the plant breeding investment or the bioscience investment, but I don’t think it really matters. There is little doubt that the investment is highly significant.

Some companies have significant investment in both areas of research: breeding and bioscience. Others, such as Dupont or Monsanto, concentrate entirely on bioscience. They have a different strategy. We believe that they are not aiming to take the products of their science to the market directly but rather to licence that technology to other companies who will then develop and market products to the farmer.

As you would expect, the top spenders on bioscience are also the top world seed companies in terms of seed sales. These companies spend between 6 and 16 percent of their total sales on research and between 13 and 50 percent of their total research on plant bioscience. Obviously these companies believe both in the future of the industry and the importance of plant biotechnology to that future.

As previously discussed, most of those companies are focusing their effort on hybrid seed markets in OECD countries and the reason for that is amply evidenced by a look at the current world seed market. Figure 2 shows the relative importance of different crops by total value of possible seed sales; both the current commercial seed market, and the additional seed, which is either farmer saved or government controlled and hence is not immediately available to private seed companies.

Obviously the private seed companies are interested in the commercial market only. They are also, as you would expect, interested in the margin available from seed rather than the sales themselves; that figure is much more difficult to identify but the one place where it might change the conclusions from figure 2 is opposite small grain cereals. Margins generally available from the sale of seed in small grain cereals are much lower than for the other crops. The reason for that is that they are not hybrids and hence it is relatively simple for a farmer to save seed. The value of purchased seed to the farmer, therefore, is relatively low and hence so is the margin to the seed company. For other crops the benefits in terms of yield and quality associated with the purchase of hybrid seed by a farmer easily justify the seed price and provide a return to farmer and the seed company.

Figure 2 shows that corn is the biggest commercial market, therefore, a significant amount of research in general and biotechnology in particular is focused on corn. Other important markets are sunflower, sugar beet, sorghum and maybe in the longer term cotton, rice, and soybean, particularly
Figure 2. The World Seed Market Field Crops, 1990

- Farmer saved/
government controlled
- Commercial market

- Corn
- Sunflower
- Sugar Beet
- Sorghum
- Rapeseed
- Cotton
- Rice
- Soya
- Small Grain Cereals

£ billion
8
7
6
5
4
3
2
1
0

US$ billion
13
12
11
10
9
8
7
6
5
4
3
2
1
0

- Farmer saved/
government controlled
- Commercial market
if these last three become generally hybrid. These crops are reflected in the focus of plant biotechnology research.

A similar situation exists geographically. As far as the commercial market is concerned, North America and West Europe dominate, and that would also be true for margins. However, South and Central America and Asia also have significant opportunities for private commercial seed sales. This then explains the primary focus of seed companies on OECD countries.

**Impact of Biotechnology**

The impact of biotechnology on those seed markets is amply illustrated in figure 3. To date the science of breeding has been the source of new products of research. If we include biotechnology in its broadest form, which includes breeding aids to speed conventional breeding programs, a combination of breeding plus biotechnology is going to take over from conventional breeding over the next 10 to 15 years in bringing new products onto the market. Other opportunities for biotechnology also exist, particularly in helping to improve opportunities downstream from the farmer. These opportunities are illustrated in the top of figure 3. Figure 3 reiterates why companies are willing to spend significant amounts of money on this new science. It is the science that will be supporting the agricultural market through and past the year 2000.

Figure 3 is fine as a sort of vision but how are we going to get there and how far have we come already? Let’s look at the sort of techniques that are being used and the possible impact they might have on the seed business in the short, medium, and longer term.

In the short term techniques to help breeding programs—like Restriction Fragment Length Polymorphism (RFLP), somaclonal variation, embryo rescue, haploidy—are going to be widely used for many crops. That’s going to have the effect of improving fundamentally the efficiency and effectiveness of the current style breeding programs. Following on from that we expect to see single gene effects, such as herbicide, insecticide, virus resistance and the increased regeneration of plants from single cells. This is the area that many people would really describe as biotechnology and may involve transformation and putting new genes into crops. The effect of this on the market is to produce new hybrids with a major benefit to the farmer because it often will be possible to manage high yields with lower inputs, for example of pesticides.

In the longer term more complicated effects are likely to be achieved through the use of biotechnology. Such effects are disease resistance or stress resistance. New crops tolerant to drought, aluminum, and other stresses are likely to result. We could also manipulate biomass or the quality and quantity of the output, for example oil versus protein in oil crops. Ultimately these techniques could result in the regulation of plant processes, for example senescence. The impact of that would be to produce for the farmer and for the end user of the products modified crop species to some form of ‘blue print’ bringing significant increase in value throughout the chain.

We have talked a little about methods of achieving the vision and the sort of targets that are likely to be achieved on various time scales, but what about the crops that are likely to be affected and on what time scales can we expect to see results in the market? The most immediate crops that are relatively easy to transform and hence add new genes to are those likely to be affected in the short to medium term. Cotton—I’m sure you’ve all heard about insect resistance; soybeans—where herbicide resistance seems to be taking the lead; and canola where novel hybridization methods are likely to be one of the first products on the market. Corn and rice have proved a little more difficult to transform.
Figure 3. Commercial Impact of Biotechnology

Market Value (£ bn) vs Market Value (US$ bn)

- Evolution & Restructuring
- Revolution & Market Growth
- Maturity

Key:
- □ Biotechnology opportunities
- □ Breeding plus biotechnology opportunities identified
- □ Conventional

Timeline:
- 1990
- 2000
- 2010
- 2020
- 2030
- 2040
and therefore they are likely to come along a little later. However, the interest in corn and the amount of work going on in that area means that products should be on the market in the medium term, say 1997-98. Finally, for two reasons, wheat is likely to take much longer. First of all it is difficult to identify a worthwhile return on this sort of biotechnology given the current market structure in wheat. Therefore companies are reluctant to invest significant amounts of money. Second, transformation of wheat is by no means easy technically and has yet to be fully demonstrated. Therefore, widespread use of the techniques associated with biotechnology in wheat is going to be a much longer-term prospect.

Nearly all that I have talked about so far applies primarily to the developed world. Work is concentrating in the OECD as I mentioned before. So what is the prospect for other countries outside the OECD and, in particular, in the developing world? I believe technology transfer will depend on four key elements. First if private companies are going to transfer technology to the developing world, then it is critical that there is a supportive commercial environment in the recipient country. For example, that there is reasonable property protection, that any private company is not going to lose its investment overnight. Second sensible regulatory processes and procedures should be in place. Third the only way that transfer can really take place is if there are appropriate local skills. Local skills to develop and build on techniques or traits that transfer from the developed world to produce products appropriate to the recipient country. It's going to be critical that there is some sort of reasonable commercial return to the private company undertaking the transfer. No company can afford to put money into areas where there will be no return on that money.

Finally perhaps one way that we can all facilitate that transfer is to think about setting up mutually beneficial collaborations between the public and local private sector research and private companies willing to transfer their technology. Where these conditions exist, transfer will be rapid because a great deal of the initial technology and work will have been paid for and developed for other markets. Therefore I believe that for products or traits developed by private sector companies, technology transfer is likely to be aimed first at newly industrialized countries and is likely to be first for hybrid crops also grown in OECD countries. That would suggest corn and sunflower are good crops on which to start. Again, collaborations probably offer a route to bring forward products for other crops.

ICI Seeds

Let me now be a little bit more specific and talk about the example - ICI Seeds. ICI Seeds is organized around three bioscience centers. One based in the United States, as the largest potential market particularly for corn. The second in the United Kingdom, because ICI is a U.K. company and has a very strong biological research base in the United Kingdom from which we hope to derive important synergies. And the third one in Continental Europe, also is a very large and significant market. Each of these centers works on world targets so that the laboratory in the United States will also be working on targets for Europe, South America, Thailand, and Australia. Similarly for the other two labs, with each lab having its own particular expertise. As you would expect in the United States we concentrate our work on corn and sorghum. In Belgium we concentrate our work on sugar beet, sunflower, and canola. The United Kingdom concentrates on what you might call fundamental research; gene hunting and cloning and bringing in new technologies that we want to evaluate or develop.
The reason we concentrate on only three centers, rather than diffusing the technology around the world immediately, is that the technology is still fairly difficult. It still requires highly trained scientists and we have found that having a critical mass of those scientists who can work together and develop ideas together leads to faster progress in the science.

I thought you might be interested to know a little bit more about the sort of targets we are working on. I can be a little more specific than I was earlier when talking about the industry. I have picked out a few of the targets we are looking at and identified their first launch dates, and where that first launch will probably be. But then also once we've made that first launch, what are the other countries we expect similar traits to be moved into?

Let's start with a product we have already launched in the United States—that is imazethapyr tolerant corn, a product you probably know better as "Pursuit" ("Pursuit is a trademark of American Cyanamid) tolerant corn. This product already has been launched in the United States and it is positioned for two purposes. The first is to offer the farmer an additional herbicide choice so he can manage his herbicide regime more effectively. And the second is in places where carry-over after a soybean crop is a problem. Other countries which have shown an interest are Brazil and Thailand and both of these opportunities are being actively followed up now so that launch should take place in 2 to 3 years. We are working on several corn diseases, primarily by using breeding aids at the moment. The first launch of these should be sometime in the mid-1990s. Again starting in the United States but also with an application in Europe.

As you probably know ICI is a leading player in the sunflower seed market. We are therefore working on several sunflower diseases using a variety of different techniques. There will be a range of launch dates ranging from the mid- to the late-1990s. One of the prime recipient countries for this technology will be Argentina where the sunflower market is large and we have a significant stake. Other countries to follow will probably be in Europe and the United States.

You may already have heard about our improved processing tomatoes which should be launched in the early- to mid-1990s starting in the United States but with potential for application in Chile, Europe, Japan, and Turkey.

I have just touched on a very few of the targets that we are working on but our problem is the same as yours. Although we spend a large proportion of our turnover on research, our resources are still limited and the ideas generated as to what we could do vastly outweigh the number of targets we can effectively pursue. If we believe a target is worth pursuing we should resource it to a level where it has a fair chance of success. So that leaves us with a problem. How do we decide what to pursue among all the ideas coming from the scientists and the commercial people, all of whom believe their idea is the one we should follow?

The process we use is fairly straightforward. It actually takes a significant amount of time because one of the things that's critical is that we take with us those scientists and commercial people—that there is some form of consensus on the targets we follow. We start by looking at both the technical and commercial implications of each target. First of all how technically feasible is each? Can the scientists say what we need to do to achieve the target or is it just a woolly idea? If it's a woolly idea, we're likely to be wasting money if we put significant money behind it at this stage. In parallel with that review, we look at the commercial value of each target. We are a commercial company, and we need to produce a return to our stakeholders, staff as well as shareholders. So we need to rank possible targets as to the sort of return they are likely to bring to ICI. What we then do is to take both those pieces of information and look at targets both by commercial value and technical viability. We then need to balance our portfolio. We need to make sure we have a fair spread of short-, medium-, and long-term targets, spread both by crop and by geographic area. Ranking these and discussing them within the commercial and technical groups gives us a short list of targets to pursue within the resources available.
So how do we pursue those targets? First of all we start out with a clear, critical path. A clear idea of where we are going on the science, what we expect the scientists to achieve and when. This also helps us to balance our resources over the next few years, both in the field, where significant support is required, and in the lab. The bioscience work in the laboratory is obviously the first step but then the work has to go out into the field, into a development program where bioscientists and breeders must work closely together. To ensure that this happens we have set up an organization around crop management groups where a small team consisting of a lead breeder, a lead bioscientist, and somebody from the strategic or commercial area work together to ensure there is a clear path to the market for any products on which we are working, and that that route to the market is the most cost-effective on a worldwide basis. Eventually the product is then launched commercially in the lead territories.

We are a fairly complicated organization. All aspects of the business must work together, must be pulling in the same direction, in order to make that commercial launch. It is necessary to pull together the basic science, as represented by the universities and our own laboratories, into field development and through to a commercial product. It is only by the whole group working together and understanding their expectations that we can make this happen on a reasonable time scale.

Conclusions

Finally I'd just like to say that ICI Seeds believes the potential market for bioscience is worldwide. We have to start somewhere, and that is where the major markets lie today, but the eventual aim is to reach markets around the globe. I believe that a great amount of effort is being expended in using biotechnology as a tool to pursue world targets to improve crops for the benefit of all countries around the world. Because of the market dynamics initial exploitation is likely to be in the OECD countries but technology transfer to other areas will be rapid if and where the right conditions exist and if we work together to make sure it happens.
LONG-TERM ISSUES AFFECTING THE ENVIRONMENT IN WHICH PUBLIC AND PRIVATE ROLES ARE PLAYED OUT
THE GLOBAL SUPPLY OF AGRICULTURAL LAND

Pierre Crosson

The Land Resource

The question addressed here is the long-term adequacy of the supply of agricultural land to meet global demands for food and fiber. Supply implies a schedule of the costs of providing land at varying levels of demand for it. The costs may be categorized in various ways. I use two categories: (a) costs paid by the farmers who use the land, for convenience I call these on-farm costs; and (b) costs paid by others, here called off-farm costs.

This categorization of costs is useful for both analysis and policy. Neoclassical theory tells us that within the resources and other constraints relevant to them, farmers will manage their resources efficiently, defined as equalization of marginal resource costs and returns. If all costs are on-farm costs, efficiency for the farmer is also efficiency for the society, and no policy issue with respect to efficiency arises. Of course efficient management, so defined, will not necessarily serve equity and other social objectives, but that is another matter, discussed below.

On-Farm Costs

These costs are those the farmer pays for use of the land, that is, land rents or their equivalent in opportunity costs, costs of land clearing and draining, of soil conservation, and any other costs of maintaining or enhancing the supply of land used by the farmer. Because the farmer pays these costs they will be reflected in the prices of agricultural output. They are, therefore, economic costs.

Off-Farm Costs

These are costs of the way farmers manage their land that are imposed on others. Examples are yield losses of downstream farmers because of rising salinity levels in irrigation return flows of upstream farmers; losses of downstream recreational values because of sediment discharges of upstream farmers; and losses of biological diversity and other off-farm habitat values when land is cleared and drained for agricultural production.

The examples indicate that some off-farm costs are economic--they show up in higher prices of agricultural or other goods and services; and some are not--they are unpriced and so are not

* Senior Fellow, Resources for the Future, Washington, D.C.
reflected in prices of marketed output. I call these unpriced costs, for example losses of biological
diversity, environmental costs.

If those who bear off-farm costs could exact compensation from the responsible farmers, then
the farmers would incorporate the costs in their land management decisions, and the resulting patterns
of land use could be presumed to be socially efficient. Typically, however, the technical and
institutional conditions relevant to off-farm costs are such that the cost of exacting compensation, the
transactions costs, are higher than the off-farm costs. For example, those suffering downstream losses
of recreational values typically have no property rights in the stretch of river between them and the
responsible upstream farmers, so no market emerges in which downstream owners could routinely
charge upstream farmers for their use of the river as a sediment dump. Lacking such a property right,
the only way downstream people can exact compensation, if extra-legal means are ruled out, is
through the courts, a costly alternative with the costs rising exponentially as the number of
downstream people and/or upstream farmers increases.

In the general case, therefore, farmers do not pay off-farm costs so they treat them as zero
and manage their land accordingly. The result is efficient for farmers but not for society because the
marginal social benefits are zero and the corresponding costs are positive. Whatever the equity or
other grounds for social interventions in land management decisions, off-farm costs make a
presumptive case for intervention on efficiency grounds.

Meaning of Adequacy

The concept of adequacy implies a standard for judging performance. The standard used here
is the effect of land supply on on-farm and off-farm costs of agricultural production. If these effects
are such that the costs are not "socially acceptable," then the supply of land would be judged
inadequate. "Socially acceptable" is put in quotes to indicate that there is no precise meaning to the
expression. The definition of socially acceptable costs will vary among regions and social groups
within countries, across countries, and over time. Despite its vagueness, however, the concept of
socially acceptable costs underlies and gives meaning to the current discussion of sustainable
agricultural development with its emphasis on efficiency and equity issues, both within and across
generations. A sustainable agriculture can be defined as one which does not generate socially
unacceptable costs, within and across generations. It follows that the supply of agricultural land can
be judged adequate when it does not violate this criterion of sustainability.

Scale Issues

The definition of the adequacy of agricultural land supply contains three scale dimensions:
temporal—long term; spatial—global; and quantitative—the amount of demand for food and fiber. Long
term here means the period from the late-1980s to 2030, a useful terminal date because it was the
target year in recent work on sustainable agriculture done for the World Bank (Crosson 1991). This
40-year period is long enough to be interesting for discussion of intergenerational issues in
sustainability analysis but not so long as to stretch beyond the range of plausible speculation about
trends in demand, technology, and land use.
The spatial dimension is global because the international trading system in agricultural commodities provides regions and nations the option of overcoming land (and other) resource constraints by substituting imports for domestic production. For this reason, the supply of agricultural land is truly global, and the question of its adequacy must be addressed at that scale. To be sure, a drive for increased food self-sufficiency or a wish to pacify domestic farmers may lead some governments to make less use of the trading option than emerging land (or other) resource constraints would indicate to be in the national economic interest. The strength of the trading system indicates, however, that most governments place high value on the trading option. This is not to say that the trading system could not be weakened by increasing protectionist policies. Should this happen, it would diminish the global supply of agricultural land. Should the trading system be strengthened, the global land supply would be increased. In this paper it is assumed that the trading system remains about as it presently is over the next several decades, thus being neutral in its effects on the global supply of agricultural land.

Other things staying the same, the probability will be higher for an adequate global supply of agricultural land over the next 40 years, the lower global demand is for agricultural output. Thus the quantitative dimension of the adequacy issue must be taken into account. In work done for the World Bank (Crosson 1991), a demand scenario was developed in which global grain consumption about doubles from the late-1980s to 2030. (Demand for grain is taken as a proxy for demand for all agricultural output). In the developing countries of Asia, Africa, and Latin America grain consumption, driven by both population and per capita income growth, increases 2.7 times. In this paper these numbers provide the quantitative dimension in the discussion of the land adequacy issue.

Adequacy of Land Supply

Meaning of Land Supply

The question, then, is whether the supply of land over the next 40 years will be adequate to accommodate a doubling of global agricultural demand—2.7 times in the developing countries—at socially acceptable on-farm and off-farm costs. In the short run the supply of land reflects two conditions. One is the physical characteristics of the soil, which affect its productivity in agricultural production, primarily topsoil depth, percent organic matter, soil water holding capacity, and soil acidity. The second condition is the number of hectares that can be brought economically into production without significant new investments to enhance or restore soil productivity, or to extend the cultivated area by clearing and drainage, or to expand the transport and institutional infrastructure serving agriculture into new areas, or to bring irrigation into arid and semiarid areas previously closed to agriculture by water scarcity.

In the long run these soil productivity and area extending investments affect the supply of agricultural land, as does competition from nonagricultural uses of the land, for example, for urban development. In this paper the focus is on long-run land supply.

In this formulation the supply of land is increased by investments to improve the physical characteristics of the soil and to extend the agricultural area, but not by investments in new yield-increasing technology for use on currently farmed land or to improve the managerial capacity of farmers. There is a certain arbitrariness in these distinctions, but they are useful for both analysis and
policy. Analytically agricultural production capacity can be thought of as a function of the quantity and quality of the land (the supply of land) and of the quantity and quality of the nonland inputs combined with the land. Policies to expand capacity, therefore, must seek patterns of investment that give proper weight to expanding land supply and to developing new knowledge, embodied in technology and people, which can be combined with the land. In this paper I focus on the potential for increasing land supply. The role of new technology and other forms of knowledge is discussed elsewhere in this symposium and also in Crosson (1991).

Buringh and Dudal (1987), using Food and Agriculture Organization (FAO) data, indicate that globally there currently are some 1500 million hectares of cropland and another 3,000 million and 4,100 million hectares of grassland and forestland, respectively. A thousand million hectares of the grassland and 800 million hectares of the forestland are judged to have the climate, topographic and soil conditions giving them high, medium, or low potential for conversion to crop production (see table 1).

Table 1. Land in Various Uses Classified by Potential for Crop Production (million hectares)

<table>
<thead>
<tr>
<th>Land Use</th>
<th>High</th>
<th>Medium</th>
<th>Low</th>
<th>Zero</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cropland</td>
<td>400</td>
<td>500</td>
<td>600</td>
<td>0</td>
<td>1,500</td>
</tr>
<tr>
<td>Grassland</td>
<td>200</td>
<td>300</td>
<td>500</td>
<td>2,000</td>
<td>3,000</td>
</tr>
<tr>
<td>Forestland</td>
<td>100</td>
<td>300</td>
<td>400</td>
<td>3,300</td>
<td>4,100</td>
</tr>
<tr>
<td>Other</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>4,800</td>
<td>4,800</td>
</tr>
<tr>
<td>Totals</td>
<td>700</td>
<td>1,100</td>
<td>1,500</td>
<td>10,100</td>
<td>13,400</td>
</tr>
</tbody>
</table>

*Source:* Buringh and Dudal (1987). The data are said to be for 1975, but in the literature they still are used to represent the present situation.

If all of the grassland and forestland with some potential for crop production (1,800 million hectares) could be brought into cultivation over the next 40 years at socially acceptable costs, the total amount of cropland would more than double, indicating that the doubling of global crop demand over that period could be accommodated without any increase in crop yields. This outcome, however, is quite unlikely because the costs of doubling the amount of cropland almost surely would not be socially acceptable. There are several reasons, discussed under the following headings: (a) costs of spatial distribution; (b) opportunity costs; (c) infrastructure costs; (d) land quality costs; and (e) off-farm sediment costs.
Costs of Spatial Distribution

Buringh and Dudal (1987) estimate that the developing countries "presently" have 1,392 million hectares of potential cropland (table 2). Because the Buringh and Dudal estimate of global potential is 1,800 million hectares (table 1), the implied estimate for the developed countries is 408 million hectares. By these calculations the developing countries have 77 percent of the potential cropland and the others have 23 percent. (Note that these calculations assume that Eastern Europe and the republics of the former Soviet Union are developed countries). Among the developed countries of Western Europe, North America, and Oceania it seems unlikely that much of any presently potential cropland will be drawn into production over the next 40 years. In the United States present thinking is that cropped land will decline some tens of millions of hectares over that period (U.S. Department of Agriculture 1990). I have not assessed prospects in other developed countries, but I judge it likely that group of countries as a whole will continue to hold tens if not hundreds of millions of potential cropland over the next several decades.

Among the developing countries 45 percent of the potential cropland is in Africa and 50 percent is in South America (table 2). The remainder is in Central America and scattered across the regions of Asia.

Table 2. Present and Potential Cropland in the Developing Countries
(millions hectares)

<table>
<thead>
<tr>
<th></th>
<th>Africa</th>
<th>S.W. Asia</th>
<th>S.E. Asia</th>
<th>Central Asia</th>
<th>South America</th>
<th>Central America</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Present</td>
<td>168</td>
<td>69</td>
<td>274</td>
<td>113</td>
<td>124</td>
<td>36</td>
<td>784</td>
</tr>
<tr>
<td>Potential</td>
<td>621</td>
<td>0</td>
<td>23</td>
<td>14</td>
<td>695</td>
<td>39</td>
<td>1,392</td>
</tr>
<tr>
<td>Total</td>
<td>789</td>
<td>69</td>
<td>297</td>
<td>127</td>
<td>819</td>
<td>75</td>
<td>2,176</td>
</tr>
</tbody>
</table>

*Source:* Calculated from Buringh and Dudal (1987), table 2.6, p. 22.

There is no particular reason in economics why the unequal distribution of unexploited cropland in the developing countries should, per se, be an obstacle to the use of that land as a resource available to them all. In principle, the better endowed countries could export to those less favored with potentially cultivable land. But in many, perhaps most, of the developing countries, there are strong political pressures to increase the percentage of domestic food demand met by domestic production. Consequently, from the standpoints of Asian countries, a hectare of uncultivated potential cropland in the developed countries or in Africa and South America is surely not equivalent to a hectare within their own borders. I do not expect the Asian countries to be driven to a policy of food autarchy by the land constraint in that region. The point, rather, is those countries are not likely to view the relative abundance of land in Latin America and Africa as a readily available resource to overcome their own land scarcity. To the extent that this is true, the cost to Asian countries of drawing on potential land elsewhere to meet their needs would be unacceptably high and the global supply of potential cropland shown in tables 1 and 2 would be correspondingly overstated.
Opportunity Costs

Converting all the land now in grass and forest with potential for crop production to that use would reduce grassland by one-third and forestland by one-fifth (table 1). I have made no projections of the demand for grass and range fed animals or for forest products, but population and per capita income growth, especially in the developing countries, suggests that these demands will increase steadily, if not sharply, over the next 40 years. Accommodating these demands at acceptable costs on one-third less grassland and one-fifth less forestland would require substantial increases in animal and timber yields on the remaining land in these uses. Whether the necessary yield increases could be achieved has to considered problematical, in my judgment. If yields fail to increase enough on the reduced land base to satisfactorily accommodate the higher demands, the opportunity costs of converting the grassland and forestland to crops would rise, constraining the supply of land for crop production.

Conversion of grassland and forestland also would incur opportunity costs in the loss of a variety of mostly unpriced yet socially important environmental services provided by these lands. Grassland and forests, particularly forests provide rich habitat for plant and animal species of high current and potential value. Hunters and lovers of wildlife spend billions of dollars each year enjoying habitat services.

Land clearing, particularly of forests, also incurs opportunity costs because of the loss of plant and animal species that clearing entails. E.O. Wilson (1989, p. 108) refers to the plant and animal genepool as the store of "biological wealth," and describes it as "... a potential source for immense untapped material wealth in the form of food, medicine, and other commercially important substances." Wilson's assessment is widely shared, although no one can accurately estimate the social value of the genepool. Even the number of species is unknown, Wilson (1989) citing estimates that range from 1.4 million to 30.0 million. Whatever the size of the plant and animal genepool, there is much agreement within and across countries that maintaining the pool at some level is important for the welfare of both present and future generations.

Forests and wetlands (some of which are forested) also provide valuable social services in connection with the hydrological cycle. On land with a given topography runoff of water from forested land generally is less (infiltration is more) than on cleared land. Relative to cleared land, therefore, forests help to moderate seasonal fluctuations in stream flows and fluctuations resulting from storm events. Wetlands provide a similar service.

Property rights in these various environmental services of grasslands and forestlands (including wetlands) are poorly developed, or nonexistent so markets mediating demand and supply conditions for the services are weak or entirely absent. The absence of market signals--prices--for the services leads farmers to underestimate their social value in making decisions to convert grassland and forestland to crops. The world environmental movement, however, has begun to substitute for markets to register the social value of the services. The movement, which includes influential members of the world community, brings pressure on the World Bank, the U.S. Agency for International Development, and governments, particularly in the developing countries, to exert more control on land clearing to protect the various environmental values under threat. Efforts to persuade the Brazilian and other governments in tropical areas to slow if not halt forest clearing provide the most prominent example of this pressure for control. So far these efforts have met with little success, but there is every reason to believe that they will continue. If the perceived values at risk are in fact high--I believe that they are--then in time the efforts to reduce the rate of land conversion likely will find some measure of success. In this case the realizable cropland potential would be less than the numbers in tables 1 and 2 suggest.
Finally, continued urban development, particularly in the developing countries, may increase the opportunity cost of keeping land in, or converting it to, agricultural uses. A simple, if not simple-minded, way to project the future increase in the amount of land in urban uses around the world is to estimate the future amount of such land per capita and then multiply by projections of population. The problem with this approach is that there are no comprehensive data on the present amount of per capita urban land use. A comprehensive search of the literature revealed this. Enough data are available, however, to provide a very rough estimate of global average present urban land use of 0.05 hectares a person. The basis for this estimate is described in some detail in Crosson (1991).

The United Nations Centre for Human Settlements (1987) projected global urban population to increase from 2,234 million in 1990 to 4,932 million in 2025. Ninety-two percent of the increase would be in the developing countries, with Asia (excluding Japan) accounting for 55 percent, Africa for 25 percent, and Latin America for 12 percent. The 215 million increase in developed countries’ urban population would take relatively little of the present and potential agricultural land in those countries. The increase in Africa (684 million people from 1990 to 2025) would take 34.2 million hectares (at 0.5 hectare a person), 4 percent of present and potential cropland in that region (table 2). In Latin America the urban population increase would take about 17 million hectares, about 2 percent of the present and potential land in crops. In Asia the projected 1,471 million increase in urban population would take 74 million hectares, 15 percent of present and potential cropland.

These comparisons must not be pressed too hard, not only because of uncertainties about the data and the projections of urban population, but also because mere numbers of hectares of present and potential cropland tell nothing about the technical, economic, and institutional conditions that convert the numbers into estimates of the supply of agricultural land. Nevertheless, the data and related discussion provide reasonably strong support for three generalizations: (a) over the next several decades, the conversion of land to urban and built up uses is not likely to constrain the supply of agricultural land in developed countries as a whole; (b) African and Latin American countries should be able to accommodate demands for urban land without seriously depleting the supply available for agriculture; (c) in Asia urban pressure on the land looks to be substantially greater than in Africa or Latin America. But even in Asia urbanization does not appear to be a major threat to the future supply of agricultural land.

Infrastructure Costs

Much of the potential cropland in the developing countries, especially in Latin America and Africa where most of it is, lies far from domestic and foreign markets and is poorly connected by road, rail, and air to those markets. In Africa this lack of transportation infrastructure perhaps is even more of a constraint to opening new land to crop production then in South America. According to a Consultative Group on International Agricultural Research (CGIAR) report, there are only 206,000 kilometers of roads in the fourteen landlocked countries of Africa. And the railroad system was developed in the colonial era primarily to link inland areas with ocean ports through which exports flowed out and imports flowed in. Consequently Central Africa, because of its vast distances from ocean ports, has no major rail links within the region, “in spite of its agricultural potential” (CGIAR 1988).

In both Africa and South America the cost of building the transportation and communication infrastructure necessary to move production inputs to the regions and take production out has to be counted as part of the cost of realizing the cropland potential of the two regions. I have not searched the literature for estimates of these costs, but they clearly imply that a hectare of potential cropland in
Africa and Asia is not the economic equivalent of a hectare already in production and therefore served by such an infrastructure.

Investments in irrigation in arid and semiarid areas extend the supply of agricultural land by opening up land previously closed to cropping by water scarcity. Yet there is some ambiguity in regarding irrigation investments as land extending rather than yield increasing. Much irrigation, particularly in east Asia, is not in arid or semiarid areas, and is designed to increase yields on already cropped land by smoothing out seasonal fluctuations in water supply and increasing security of supply. Moreover, the aggregated data on global quantities of irrigated land do not separate that in arid and semiarid areas from that in semihumid and humid areas. For these reasons my treatment here of irrigation investments as increasing land supply is not as sharply focused as I would like it to be.

In 1986, global irrigated land was 253 million hectares (World Bank/UNDP 1990). Almost two-thirds of this was in five countries: India (56 million hectares), China (46 million hectares), the United States (23 million hectares), the Soviet Union (21 million hectares), and Pakistan (16 million hectares). Of the 253 million hectares, 185 million (73 percent) were in the developing countries. India, China, and Pakistan alone accounted for 118 million hectares, 47 percent of the world total and 64 percent of the developing countries total. The next three most important developing countries in irrigated hectares were Indonesia (7.3 million), Iran (5.8 million), and Mexico (5.3 million).

The importance of irrigation in world agricultural production, especially in Asia, is apparent. But how much potential is there for continued expansion of irrigated land over the next several decades? The World Bank/UNDP (1990), citing the FAO, the International Commission on Irrigation and Drainage (ICID), and World Bank sources estimates that there are an additional 137 million hectares worldwide, which have potential for irrigation, although noting that the estimate is speculative because it depends not only on the physical resource base but also on future economic conditions.

Table 3 shows the estimates of remaining land with potential for irrigation. Globally 137.5 million hectares of potentially irrigated land remain, 80 percent of it in the developing countries. Although the greatest potential increases in percentage terms are in South America and Sub-Saharan Africa (217 percent and 477 percent, respectively), the greatest absolute potential is in the Far East, with 69.4 million hectares. This is 58 percent of the total potential increase in the developing countries. Table 3 does not show it, but almost 60 percent of the developing countries potential is in just three countries: Brazil, China, and India (World Bank/UNDP 1990, p. 104). India and China plan to develop virtually all of their remaining potential by 2000 (World Bank/UNDP 1990, p. 104).

These estimates of potentially irrigable land must be treated with the same caution as those for all potential cropland because they don’t take into account a host of economic and institutional constraints which likely will hold actual expansion of irrigated area well below the potential indicated in table 3. The constraints are considered in some detail in Crosson (1991). Briefly, they reflect deeply ingrained inefficiencies in management of irrigation systems; rising construction costs because the most favorable sites have already been developed; unfavorable natural conditions of topography and precipitation; lack of people trained in managing large-scale irrigation projects, especially in Africa; rising and potentially powerful competition from urban and other nonagricultural uses of water, for example, to maintain instream plant and animal habitat; and inadequate control of salinity and waterlogging. To be sure some of these constraints can be eased. With sufficient political will and investments in training, management can be improved; and techniques for controlling salinity and waterlogging are well known. But other constraints, such as rising costs and increasing competition from nonagricultural uses of water, will remain and limit future expansion of the irrigated area.
Table 3. Presently Irrigated Land and Land with Irrigation Potential

<table>
<thead>
<tr>
<th></th>
<th>Presently irrigated (000 hectares)</th>
<th>Potentially irrigable (000 hectares)</th>
<th>Potential increase (percent)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Developed countries</td>
<td>68,000</td>
<td>27,000</td>
<td>40</td>
</tr>
<tr>
<td>Developing countries</td>
<td>186,000</td>
<td>110,500</td>
<td>59</td>
</tr>
<tr>
<td>Africa</td>
<td>11,025</td>
<td>18,175</td>
<td>165</td>
</tr>
<tr>
<td>North</td>
<td>7,560</td>
<td>1,640</td>
<td>22</td>
</tr>
<tr>
<td>Sub-Saharan</td>
<td>3,465</td>
<td>16,535</td>
<td>477</td>
</tr>
<tr>
<td>Latin America</td>
<td>16,265</td>
<td>22,865</td>
<td>141</td>
</tr>
<tr>
<td>North and Central</td>
<td>7,035</td>
<td>2,865</td>
<td>41</td>
</tr>
<tr>
<td>South</td>
<td>9,200</td>
<td>20,000</td>
<td>217</td>
</tr>
<tr>
<td>Asia</td>
<td>158,380</td>
<td>69,420</td>
<td>44</td>
</tr>
<tr>
<td>Near East</td>
<td>18,315</td>
<td>5,185</td>
<td>28</td>
</tr>
<tr>
<td>Far East</td>
<td>140,065</td>
<td>64,235</td>
<td>46</td>
</tr>
</tbody>
</table>


The Quality of Potential Cropland

There is a presumption that the quality of potential cropland generally is less than that of land already in crop production because typically the better land would be developed first. The data in table 1, rearranged as in table 4, support this view.

Table 4. Distribution of Present and Potential Cropland by Quality (percent)

<table>
<thead>
<tr>
<th></th>
<th>Present</th>
<th>Potential</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>27</td>
<td>17</td>
</tr>
<tr>
<td>Medium</td>
<td>33</td>
<td>33</td>
</tr>
<tr>
<td>Low</td>
<td>40</td>
<td>50</td>
</tr>
</tbody>
</table>

Source: Derived from table 1.

These land quality differences are not dramatic, but they suggest, nonetheless, that the costs of crop production on the potential land would tend to be higher than on land already in production. On this score also, therefore, a hectare of potential cropland cannot be regarded as the economic equivalent of a hectare already in crop production.
Off-Farm Sediment Costs

When soil eroded from farmers' fields is carried by runoff to waterways it imposes a variety of damages such as reduced life of reservoirs because of accelerated siltation, impaired water-based recreational values because of turbidity, increased flooding damage because sedimentation lifts streambeds, and damage to fish spawning areas in streams. Eckholm (1976) published evidence indicating that the costs of these damages were high all around the world, especially in the developing countries. A number of more recent World Bank reports are generally consistent with Eckholm's assessment.

Although firm data are lacking, there is a general presumption that the potential cropland around the world is likely to be more erosive when converted to crop production than land already in crops. The presumption is based on the idea that the least erosive land would be cropped first. But even if the potential cropland would be no more erosive than presently cropped land, converting it to crops would surely result in a vast increase in erosion because the per hectare rate of cropland erosion is several times that of grasslands and forestlands. Such an increase in erosion likely would cause a substantial increase in off-farm sediment damages. Because these damages already are high, the prospect of making them even higher would probably induce a variety of public measures to avoid or at least moderate the increase. The surest way to achieve this would be to control the conversion of grassland and forestland to crops. To the extent that these measures were successful, potential cropland would be less than indicated in table 1.

Summary

The skewed spatial distribution of potential cropland globally and the prospective economic and environmental costs of bringing it into crop production strongly suggest that the realizable potential is far less than the doubling of area suggested by table 1. Among the developing countries, where most of the increased demand for agricultural output will occur, Africa and Latin America clearly have more potential for increasing the supply of land than Asia, but even in those areas the various cost constraints probably will keep the expansion of cropland well below the apparent potential.

Cost of Maintaining and Enhancing Soil Productivity

As noted at the outset the long-run supply of land is a function not only of the quantity of land but also of its productivity as determined by such soil characteristics as topsoil depth, percent organic matter, soil acidity, and water holding capacity. Investments and management practices to protect and enhance these soil characteristics support and extend the supply of land just as do investments to bring additional land into production.

The discussion here focuses on some of these aspects of soil quality, on various processes tending to degrade quality, and on measures to protect and enhance quality. Most of the discussion concerns the developing countries, with occasional references to the developed countries.
Soil Characteristics in the Developing Countries

Table 5 shows estimates of the quantities of different soils in the tropics and in the semiarid tropics of Africa and Latin America. The three soil orders, Oxisols, Alfisols, and Ultisols, account for over 55 percent of the tropical soils and for 46 percent and 47 percent, respectively, of the soils in the semiarid tropics of Africa and Latin America. Stewart, Lal, and El-Swaify (1991) describe these as "low-activity clay" soils and Lal (1984, p. 76) states that they "exhibit little swell-shrink capacity. On drying, most of these soils become hard and have unusually high strength...", which inhibits seedling emergence.

Table 5 indicates that Aridisols account for 21 percent of tropical soils and 30 percent and 14 percent, respectively, in the semiarid tropics of Africa and Latin America. Stewart, Lal, and El-Swaify (1991, p. 131) write that these soils are relatively low in organic matter and that in most years their moisture content is inadequate to mature a crop without irrigation.

Table 5. Land Area in Different Soils in the Tropics and Semiarid Tropics of Africa and Latin America (million hectares)

<table>
<thead>
<tr>
<th>Soil order</th>
<th>Tropics</th>
<th>Semiarid tropics of Africa</th>
<th>Latin America</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alfisols</td>
<td>800</td>
<td>466</td>
<td>107</td>
</tr>
<tr>
<td>Aridisols</td>
<td>900</td>
<td>440</td>
<td>33</td>
</tr>
<tr>
<td>Entisols</td>
<td>400</td>
<td>255</td>
<td>17</td>
</tr>
<tr>
<td>Inceptisols</td>
<td>400</td>
<td>38</td>
<td>-</td>
</tr>
<tr>
<td>Mollisols</td>
<td>50</td>
<td>-</td>
<td>78</td>
</tr>
<tr>
<td>Oxisols</td>
<td>1,100</td>
<td>188</td>
<td>-</td>
</tr>
<tr>
<td>Ultisols</td>
<td>550</td>
<td>24</td>
<td>8</td>
</tr>
<tr>
<td>Vertisols</td>
<td>100</td>
<td>51</td>
<td>-</td>
</tr>
<tr>
<td>Totals</td>
<td>4,300</td>
<td>1,462</td>
<td>243</td>
</tr>
</tbody>
</table>

Source: Adapted from Stewart, Lal, and El-Swaify (1991, table 3.3, p. 132). For a brief description of the soil orders, see the text.

Lal (1984, p. 77) notes that after a "relatively long period of natural or planted fallow" the organic matter content of the surface layer of tropical soils, in general, is comparable to that in temperate region soils. However, the organic matter in tropical soils typically is concentrated in the top 5 to 10 centimeters. With land clearing, the soil organic matter is oxidized at a rate about four times faster than in temperate zone soils, and declines sharply in as little as 2 or 3 years. This is particularly significant for the low-activity clay soils, such as the Oxisols, Alfisols, and Ultisols, because in these soils "...organic matter plays a very important role in improving structural stability, decreasing compactibility, improving soil available water and nutrient resources, decreasing leaching losses, and enhancing biological activity of soil fauna (for example, earthworms, etc.)" Lal (1984, p. 77-8).

Lal (1986) developed a three-point rating system for classifying the principal tropical soils according to factors that constrain their productivity in cultivation. Table 6 shows this classification system. With the exception of trafficability and chemical and nutritional status, productivity of the
Alfisols is seriously constrained for cultivation. These soils make up 19 percent of all tropical soils (table 5). The Oxisols and Ultisols, which jointly account for another 38 percent of all tropical soils are severely-to-moderately constrained by all the factors except soil crusting and trafficability. Note that the least constrained soils, the Mollisols, account for only 50 million hectares in the tropics (a little over 1 percent of the total). In the United States the 232 million hectares of Mollisols make up 26 percent of the total (Stewart, Lal, and El-Swaify 1991, p. 132).

Table 6. Soil-Related Constraints to Use of Tropical Soils for Cultivation

<table>
<thead>
<tr>
<th></th>
<th>Oxisols</th>
<th>Ultisols</th>
<th>Alfisols</th>
<th>Inceptisols</th>
<th>Vertisols</th>
<th>Mollisols</th>
</tr>
</thead>
<tbody>
<tr>
<td>Erosion</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Compaction</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>2</td>
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<td>Supraoptimal soil</td>
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Note: 3 is severe, 2 is moderate, and 1 is slight.

Because of these characteristics of tropical soils they are widely referred to as "acid and infertile," and many observers have concluded that the potential for increasing the productivity of the soils is low. A growing body of evidence exists, however, suggesting that this view may be more pessimistic than is warranted. Sanchez (1991) reports the results of research he and colleagues have done over more than a decade on production systems in the tropics of Latin America that indicate that tropical soils can in fact be much more productive than conventional wisdom suggests. Sanchez (1992, p. 115) states that the research results point to the conclusion that sustainable agriculture is feasible on humid tropical soils. "The classic form of high-input agriculture that feeds the world, including the green revolution areas in the tropics, is technically feasible in the tropics." To be economical the systems require a high level of farm management and a transport and marketing infrastructure to supply inputs of nutrients and to move production out. But with the investments needed to provide these services, Sanchez's results indicate that the productivity constraints imposed by the "acid-infertile" soils of the humid tropics can be substantially eased.

In dryland areas (less than 800 millimeters of annual precipitation) where irrigation is not feasible techniques to restore soil water holding capacity or increase water retention can increase the supply of agricultural land. Practices, which maintain crop residues on the land, help to build soil organic matter, not only increasing the soil nutrient supply but also restoring soil water holding capacity where it has been impaired. Crop residues also reduce water runoff with corresponding increases in soil moisture.
Over the last decade or so the planting of vetiver grass has emerged as a technique with a variety of favorable effects on soil characteristics. The grass is planted along field borders in the direction of runoff and in a few years grows into a thick, high hedge. Runoff is greatly reduced, with corresponding increases in water retention, and soil eroded from upslope collects behind the hedge, increasing soil rooting depth. Nelson (1988, p. 13) asserts that vetiver grass is "exciting, with potential for a significant impact..." for increasing the productivity of soils under threat of erosion and low moisture retention capacity.

Compared to so-called engineering techniques for controlling runoff and erosion, for example, the building of terraces, the use of vetiver grass and other vegetative materials is not difficult to master by individual farmers and is low cost, involving little investment apart from the farmer's time. How much these techniques might contribute to expanding the global supply of agricultural land over the next several decades is unknown, but there clearly seems to be some potential.

Land Degradation

Erosion, soil compaction, soil salinity buildup and water logging degrade the productivity of the soil by, variously, reducing the rooting zone and soil porosity, impairing soil water holding capacity, removing soil organic matter and nutrients, and generally creating a soil environment hostile to desired plant growth.

Soil degradation is widely believed to be a major threat to the present and future supply of agricultural land, especially in the developing countries but also in some of the developed countries, for example, the United States, Canada, and Australia. The fact is, however, that apart from the United States, very little is known about rates of land degradation around the world and its soil productivity consequences (Nelson 1988; Dregne 1988; Stocking 1984). In the United States, the one country where data have permitted comprehensive analyses of the degradation issue, the results indicate the productivity consequences have been exaggerated greatly. Research by soil scientists and economists with the U.S. Department of Agriculture (USDA) reported in Alt, Osborn, and Colaccio (1989), by soil scientists at the University of Minnesota (Pierce and others 1984) and by economists at Resources for the Future (Crosson 1986) shows that continuation of 1980s' rates of cropland erosion for 100 years in the United States would reduce yields at the end of the period 5 to 10 percent relative to what they would be in the absence of erosion. Over the 40-year horizon considered here the erosion-induced yield decline would be even less.

There are two ways to view this result. One is that even if the rate of technology driven crop yield increases in the United States were to fall to one-half the 1.5 to 2.0 percent annual rate achieved over the last 40 years, the increase would swamp the negative effect of erosion. The other is that even if erosion-induced losses of soil productivity were driven to zero in the United States the contribution to extending the supply of agricultural land would be minor--a few percent--and the cost would be high. (Studies at the USDA show that the marginal cost of reducing erosion rises steeply as the remaining amount of erosion declines.)

The experience of the United States with respect to soil erosion probably is not a good indicator of experience in other countries, especially in the developing countries. Tropical soils generally are more susceptible to erosion than temperate zone soils (Stocking 1984; Lal 1984). Moreover, unlike other countries, the United States has had a substantial soil conservation program in place for almost 60 years.

Except in Africa, grain yields in the developing countries have increased at a faster rate than in the United States over the last three decades, suggesting that whatever the productivity effects of erosion and other forms of land degradation in those countries, they have not yet been major. (The reasons for poor yield performance in Africa are much debated. Land degradation may be one but
perverse government policies toward agriculture probably are more important.) The failure of land degradation effects to show up so far in the developing countries does not mean that they may not eventually, with significant negative consequences for agricultural land supply. There is no convincing present evidence that this will happen, but the possibility that it may cannot be ruled out.

Conclusion

The likelihood of expanding the supply of agricultural land enough to accommodate at acceptable costs a doubling in global demand for agricultural output and a 2.7 times increase in demand in the developing countries over the next 40 years is small too negligible. Some extension of the agricultural area no doubt can be achieved at acceptable costs, and some acceptable increase in land supply by protecting and enhancing soil productivity also should be manageable. How much these measures might increase land supply is completely uncertain. I hazard a guess, based admittedly on no tangible evidence, that such an increase would not exceed one-fourth to one-third from the present base.

The implication is that the global supply of agricultural land will be inadequate to accommodate the prospective increase in global demand. Satisfying that demand at acceptable costs will require major, sustained increases in knowledge about agricultural production and how to manage its off-farm consequences. How to achieve the necessary knowledge increases is the critical question in achieving sustainable agricultural production. But the question lies outside the bounds of this paper.

Endnotes

1. Oldeman, Hakkeling, and Sombroek (1991) have published a map showing the severity of human-induced soil degradation in the world. The map covers the land surface between 72 degrees north and 57 degrees south, an area of 13,013 million hectares. Some 1,964 million hectares are degraded to some extent: 746 million hectares (38 percent) lightly, 903 million hectares (46 percent) moderately, 295 million hectares (15 percent) strongly, and about 19 million hectares (less than 1 percent) severely. Interpretation of these numbers is uncertain because of some ambiguity in the definitions of severity of erosion. For example, the map shows much of the American Midwest to be "moderately to severely" degraded, meaning that the productivity of the soil has been "greatly reduced" and could be restored only with "major improvements." Yet crop yields in this region have increased sharply and steadily over the last 40 years, and leading American soil scientists consider soils in the region to be in generally good condition.
References


LAND USE PLANNING AND PRODUCTIVE CAPACITY ASSESSMENT

Wim Sombroek*

Introduction

The determination of the "productive capacity" of the land is the main component of the Food and Agriculture Organization of the United Nations' (FAO) Agroecological Zones (AEZ) approach, and it is also an element in the sequence of land evaluation and land use planning as advocated by FAO for use in developing countries. The nature of the subject lends itself to little or no privatization, which is the main theme of the present Symposium. At the international level specialized scientific institutions and development agencies such as FAO should continue to take the lead. At national and provincial level ministerial and parastatal entities on natural resources inventory, monitoring, and assessment are the logical executing bodies. Usually national soil survey and land evaluation centers take the lead. They may be performing comprehensively in their own right; often they have the broadest and most detailed geo-referenced data bases on natural resources, and are then the first institution to be contacted on the definition of scope and geographic location of envisaged development or conservation projects. However, in many cases they need to be stimulated to obtain the effective cooperation of other national centers such as meteorological departments, remote sensing imagery holding centers, vegetation and land use monitoring institutes, farming system analysis groups, and environmental conservation units. Only in a few cases the need for an integrated and holistic approach to agroecological zoning and land use planning has translated itself into interministerial, multidisciplinary institutions with undisputed responsibility and ensured long-term financial and establishment arrangements.

Some Definitions

First a number of definitions should be given (FAO 1992):

**Land**: An area of the earth's surface, including all elements of the physical environment that influence land use. Thus land refers not only to soil but also landforms, climate and hydrology, plant and animal population, and the physical results of human activity like terraces and drainage works.

**Land characteristic** (or property): An attribute of the land that can be measured or estimated, for example slope angle, soil depth, mean annual rainfall.

**Land quality**: A complex attribute of land that affects the suitability of the land for a specified use in a distinct way, that is, largely independent from other qualities. For example, the quality 'sufficiency

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* Wim Sombroek is Director of the Land and Water Development Division, FAO, Rome.
of water directly affects crop yields and, therefore, land suitability for that crop. Land qualities can only be assessed by modeling the interaction of a number of measurable land characteristics.

**Land capability classification**: A classification of the land in terms of its potential for use in specified ways and with specified management practices (United States Department of Agriculture, USDA).

**Land evaluation**: The assessment of the suitability of land for a specified use, in terms of sustainability, production, and the inputs needed to assure that production and economic return.

**Land use**: The management of land to meet human needs. This embraces rural land use such as agriculture, forestry, and aquaculture as well as all forms of urban and industrial use.

**Land use (or utilization) type**: A kind of land use, current or envisaged, described in enough detail to assess its land requirements and to plan the necessary inputs. Equivalent to an individual farm enterprise like irrigated rice production or dairy farming.

**Sustainable land use**: Use of the land that does not progressively degrade its productive capacity.

**Land use planning**: A coherent set of decisions about the use of land and ways to achieve the desired use. A land use plan consists of a definition of goals; an ordering of land, human, and material resources; an explicit statement of the methods, organization, responsibilities, and schedule to be used; and agreed targets.

**Agroclimatic region**: An area of land that is suited to a specified range of crops, defined in terms of its temperature and rainfall regime and especially its growing period.

**Agroecological zoning**: The process of quantifying the productive capacity of land resources for human use, in dependence of the physical and biological characteristics.

### The Agroecological Zoning Approach

To assess the productive capacity of the land at regional and global level the FAO developed, as a sequel to its world inventory of soil resources (FAO, 1971-78), the concept of Agroecological Zones and its application for the determination of the potential population supporting capacities at three different levels of input (Higgins and others 1987, see also the brochure "How Good the Earth," FAO 1991). The agroecological zones delineations are being taken up now by the international agricultural research centers of the Consultative Group on International Agricultural Research (CGIAR) system, and by the Terrestrial Ecosystem research program of the International Geosphere-Biosphere Programme (IGBP). The AEZ methodology also is to be used for an assessment of the effects on productive capacity and human carrying capacity of the surmised climatic change (the enhanced greenhouse effect) at global, regional, and country level. Country level applications at present-day climatic conditions already have been carried out, with ad-hoc financing, for Kenya, Mozambique, Bangladesh and less detailed for the Philippines, Indonesia, and Malaysia, and is currently under way for the whole of China. The requests for country level AEZ studies are increasing rapidly and it is hoped that the expertise, which presently exists in FAO’s regular program, can be continued and strengthened.

Elements used in AEZ are (a) the establishment of the photosynthesis and temperature requirements of individual crops (C3 and C4 plants); (b) a detailed agroclimatic inventory (determining the length of growing period of the land, based on thermal regimes and moisture availability over the year); and (c) a small-scale, that is, low-resolution soil inventory (especially regarding the soil moisture storage capacities). These elements are then combined to assess the agroclimatic suitability for each crop, soil type, and level of external input (high, medium, or low).
Parameters not included thus far are (a) the hydrological resources of the land (surface and groundwater), a clear omission but unavoidable because of the near absence of systematic inventories of these resources at regional and national level; (b) certain climatic parameters of importance at higher latitudes (day-length, permafrost) because studies in such areas were not requested from FAO thus far; and (c) the value of the natural land cover (timber, fuel, fodder nutrients of the standing biomass, biodiversity, vegetative protection against forms of land degradation). However, see the discussion of the proposed agroecological zoning of the Amazon region.

Although originally meant for regional and continental assessments, the AEZ methodology has been developed further and is proving to be a valuable tool for planning at the national and provincial levels as well. For instance, it can be used to identify areas that cannot remain self-sufficient in food production, it can indicate future food transport and storage requirements, and it can identify areas with a potential for resettlement and agricultural development. At that point the land use planning methodology takes over, at catchment area levels, in specific land and water development project areas, and in village level development and conservation schemes.

**Land Use Planning**

Land use planning at the local level has been a human activity since time immemorial. However, formalization of its methodological aspects for application in developing countries is rather recent. FAO has been involved in land use planning for many years, both at project and village level. Based on ad-hoc experience over the years, it has developed sets of guidelines, which became gradually more precise and quantitative. Recently, a holistic approach has been introduced, including environmental and ecological considerations. Some relevant publications are "A Framework for Land Evaluation" (FAO 1976), which was developed in consultation with an interdisciplinary working group at Wageningen, the Netherlands, and followed by guidelines for its application to rainfed agriculture (FAO 1983), forestry (FAO 1984), to irrigated agriculture (FAO 1985) and to extensive grazing (FAO 1990). "Guidelines for Land Use Planning" (FAO 1992) was produced by an FAO Interdepartmental Working Group on land use planning. It is based in part on a number of country level land use planning manuals such as those from the United States, Australia, Canada, Bangladesh, Tanzania, Sri Lanka, Ethiopia, Zambia, and so forth.

The recommended steps in systematic land use planning are:

**Step 1** - Decide what you want to achieve. Define the present situation; determine the needs of the people; agree and specify the goals to be worked for.

**Step 2** - Plan to plan. Organize the work needed. Select methods.

**Step 3** - Identify and structure the problems and opportunities of the planning area, including legal requirements.

**Step 4** - Devise alternative solutions. Identify or design alternative land use types that might achieve the goals.
Step 5 - Evaluate land suitability. For each promising land use type, establish its land requirements and match these with what the land has to offer to establish physical suitability.

Step 6 - Appraise alternatives. For each physically suitable combination of land use and land, assess the environmental, economic, and social impact.

Step 7 - Choose the best achievable land use. Use selected methods of decisionmaking.

Step 8 - Draw up a land use plan, allocating land uses to land, and making provision for appropriate management.

Step 9 - Put the plan into action. Action by decisionmakers, lawmakers, sectoral agencies, and land users.

Step 10 - Learn from the plan. Monitor progress toward the goals; revise the plan in the light of experience and to accommodate new goals.

It may be obvious that this is a truly multidisciplinary and interdisciplinary exercise, involving many people: the land users, the planning team(s), and the decisionmakers, with involvement of the legislature, the executive and sectoral agencies (research entities, mapping institutions, extension services) at both national, province, district, and village level. The process looks straightforward and without ambiguities. The various steps are, however, full of uncertainties and pitfalls. Some examples follow:

Step 1. The terms of reference imply the existence of a national land use policy (soil policy, water services policy, commodity promotion policy, and so forth), but in many countries such a policy, or elements of it, is still nonexistent. The land use planning team may be assigned to the central office or local representatives of the ministry of agriculture or forestry or animal husbandry, the ministry of natural resources or environment, the ministry of economic planning or a ministry of local development. Worse, the team components may be scattered throughout these ministries and semiautonomous institutions, having no experience in cooperation and tending to frustrate cooperation for fear of loss of their own authority and financial resources.

Step 4. The study of relevant land use types presupposes the existence of a reliable data base on current land use, not only in the sense of statistics for each province or district but also geo-referenced, and not only in the identification of produce involved but also in its farming characteristics (labor, degree of external input, farm size and tenure, gender issues, and so forth, in other words a farming system analysis). Mapping of current land uses in this sense has been a neglected item in many countries, in part because there is no well-defined and agreed on international system of land use typology and classification that may provide guidelines.

Step 5. The land resources surveys and the subsequent "physical" land evaluation have a number of problems too. Soil surveys in the past often were restricted to taxonomic identification of the main soils and carried out in isolation from landform, hydrological, vegetation, or land use surveys. This resulted in an unwieldy multitude of boundaries when individual mapping units on each of these land elements are integrated in a land information system. Only gradually the idea is being accepted that land form (land system and land facet) delineations should form not only the logical but also a convenient basis for the integration of the natural resources in a Geographic Information System (GIS).
Land qualities, as compound attributes of the land can be assessed only by modeling the interaction of a number of measurable single land characteristics. These models have not yet been worked out systematically as algorithms for all land qualities. The evaluation of the physical and biological land resources, through a systematic comparison of the respective land qualities in relation to the envisaged land utilization types (a "matching" or "weighting" procedure), cannot as yet be done completely automatically through the application of a well-defined and proven set of rules. A system fit for a country or group of similar countries is feasible, if indeed developed by physical geographers, soil, or environmental scientists with keen and open eyes for plant growth behavior and land surface conditions, ample experience in the study area concerned, and a willingness to listen to the wisdom of local farming communities as accumulated over the ages. In a number of cases it has already proved possible to transplant a system of land evaluation, with modification, to distant countries. However, an automated system for worldwide practical application may remain an elusive goal for the near future.

Step 7. The incorporation of environmental, economic, and social conditions and considerations to select viable land use options is at least as complicated as the activities in Step 6. For instance, the appraisal of the biotic land qualities in their own right is still in its infancy; the sustainability of the envisaged land use throughout many years to come can only be guessed ("backtracking" long-term ecological research may be helpful); the economic analysis has many built-in uncertainties as to the future marketability of the produce mix envisaged; the expected development of the social conditions may change radically in a few years’ time, and so forth. Examples of such changes are regional calamitous droughts and explosions of AIDS in parts of Africa.

The involvement of the local population in the planning process is often token and short-lived. By and large the local traditional land users still are seen as part of the problem rather than as part of the solution. But even if given a real chance to participate in the planning process, the local population may wholeheartedly cooperate only if they see obvious advantages in any change, and become convinced of a long-term interest in their well-being and development from the authorities’ sides. If such guarantees are absent or not apparent to them, or if some prove to be phoney, then the average small farmer will stick to his/her traditional risk minimalization, or fall back upon this once the external pressure to change has diminished.

Step 9. The plan implementation has its own pitfalls. Too often the technical recommendations of the land evaluations are shoved aside or unilaterally modified at the implementation of major project activities. This is because of the common tendency of the executors (development agencies, construction firms, local politicians) to arrive at something grandiose and showy, instead of being satisfied with such, possibly modest, grassroot level changes as may be required for sustainability. There are examples galore of disastrous "white-elephant" development projects; modesty is a rare virtue.

The Approach Exemplified

The following is an example of the combination of the agroecological zoning approach and land use planning in a region that is attracting much attention and concern worldwide right now—the Amazon region.

Thirty years ago this region was forgotten and practically unknown. The Brazilian Government requested the presence of an FAO/UNESCO multidisciplinary team to assist in development planning in the region. This resulted, among others things, in a plan for the harmonious
development and protection of an area along the first Amazon highway just opened (Belém-Brasilia). A forest reserve for sustainable production was delineated in the part with the highest commercial timber volume, with a core area to be completely protected because of its intrinsically high biological diversity value, and buffered from the advancing shifting cultivation front from the north (Belém) by an area of carefully planned smallholders' settlements. The plan was never executed and the data gathered on forest resources and soil conditions served only to speed up massive deforestation in the area. At present the Paragominas area is largely a wasteland of abandoned ranching land, with scars in the landscape where bauxite mining was developed, because of the unintentional delineation of that geologic resource on the soil and landform map.

Again at the request of the Brazilian Government, FAO carried out a Technical Cooperation Activity in 1989-90 on the formulation of a major agroecological zoning project to arrive at rational land use planning for the Amazon region, with due regard to environmental values and the well-being of the traditional riverine and forest population. The land utilization types envisaged at such an exercise were:

- Indigenous areas (already demarcated or proposed)
- Nature conservation (national parks)
- Protection of the natural vegetative cover throughout, without any direct use (for example upper catchments)
- Conservation as biological or genebank reserves
- Extraction of non-timber resources on a sustainable basis
- Commercial exploitation of timber on a selective and sustained basis, leaving the natural forest structure intact
- Systematic production of timber, pulp or charcoal from planted forests
- Traditional shifting cultivation
- Agroforestry systems
- Cultivation of perennials
- Pasture establishment (ranching)
- Permanent production of annual crops.

The steps for such a zoning and planning for a coherent system of agroecological and socioeconomic zoning for the Brazilian Amazon Region were suggested as follows (FAO 1989):

I. Cadastration - Development and maintenance of a system of cartographic information of all data that is already available (surveys, remote sensing imagery) at regional and state levels.

II. Prezoning - Identification and characterization of natural land units, land utilization types, and socioeconomic conditions.

A. Delineation of natural land units and thematic analysis of their geology, geomorphology, climate, hydrology, relief, soils, vegetation, fauna, and present land use.

B. Determination of the physico-biological land qualities and limitations for each type of natural land unit distinguished. An example of A. + B. is formed by the recent Superintendencia de Desenvolvimento da Amazonia (Belem)/Fundacao Instituto Brasileiro de Geografia e Estatistica (Rio de Janeiro) (SUDAM/IBGE) thematic maps
on "prezoneamento," scale 1:2,500,000, for the whole region, though without climatology, hydrology, and fauna.

Simultaneously, the following need to be carried out.

C. Identification of agroecologically viable land utilization types.

D. Determination of the physical-biological requirements of each land utilization type.

E. Characterization of the socioeconomic conditions and perspectives for each subregion, hydrographic subbasins, or municipalities, and of areas already demarcated for specific use such as "areas indigenas," biological reserves, and natural production forests.

III. Zoning (sensu stricto) - Physico-biological rating of natural land units, comparison with socioeconomic conditions, and delineation of recommended land utilization types.

A. Systematic comparison, through a process of matching and weighting, of the physico-biologic qualities of each identified natural land unit, with the physico-biologic requirements of each envisaged land utilization type; resulting in a rating of the land units in classes of physico-biological potential for each land utilization type on a sustained basis. An example is the recent agroecological zoning for the whole region, at scale 1:5,000,000, by Empresa Brasileira de Pesquisas Agropecuarias (Brasilia)/Servico Nacional de Levantamento e Conservacao de Solos (Rio de Janeiro) (EMBRAPA/SNLCS), though without incorporation of biological diversity.

B. Modification of the physico-biological rating through comparison with the prevailing socioeconomic conditions; resulting in the identification of the preferred and recommended land utilization or nonutilization type per land unit or combination of land units, and its cartographic delineation. The latter is the formal end product of the zoning process. Examples are the socioeconomic-ecologic zonings carried out by the Programa de Desenvolvimento Integral de Noroeste de Brasil (POLONOROESTE) program for Rondonia and Mato Grosso, and by Projeto de Protecao ao Neio Ambiente e das Comunidades Indigenas (IBGE/PMACI) for western Acre, both at scale 1:1,000,000.

This exercise is a dynamic process; it will have to be repeated every 10 to 20 years, taking into account newly emerging technological and socioeconomic conditions.

IV. Post-zoning - The zoning work should be followed by a process of regional physical planning ("amenagement du territoire") that includes planning; preprojects for legislation; political decisions; implementation, legal, administrative, and institutional; and demarcation on the ground, inspection, and control of its adherence.

In principle this sequence is scale independent. It can be applied at any level of intensity or detail. In the Brazilian case a preliminary zoning at scale 1:5 million or 1:2.5 million was foreseen, a
systematic zoning at scale 1:1 million or 1:500,000, and a semidetailed zoning at scale 1:100,000 or so. The more detailed the level, the more quantified the information has to be and the more precise the areal delineation.

The practical examples given in the sequence illustrate the acknowledgement and integration of methods and activities already developed and carried out by a number of national Brazilian institutions. Whether in practice these institutions will be prepared to harmonize methods and to cooperate effectively, a main aim of the envisaged FAO project, still remains an open question. Any FAO involvement is complicated further by the issue of the formal authority and responsibility, morally and technically, for the ecological zoning and subsequent land use planning for the Brazilian Amazon region: Does this authority lie with the national or international scientific or popular ecological community; with the cooperating countries of the whole Amazon region; with the Federal Brazilian Government; with the nine individual states of the Brazilian Amazon; with the local town and commercial communities, or with the traditional forest dwellers?

Some Postscriptum Statements

There is a strong need for geo-referenced, quantified, computer-assisted, and compatible data bases on natural resources, both at global or continental and at national level. In such data bases, hydrological and soils information should preferably be linked systematically to landform information.

There is an acute shortage of geo-referenced information on current land uses, and on their characterization in terms of produce, type of land and water management, socioeconomic conditions, and degree of change or departure from "natural" ecological conditions.

In the discussions on the value of biodiversity one should not forget the stock of human-induced "land races" (plant and animal) in traditional farming systems, especially those based on smallholder mixed farming practices.

The concept of "low-external input sustainable agriculture" (LEISA) implies the acceptance of local nutrient mining and microgeographic nutrient harvesting. In view of the ongoing rapid population growth in many developing countries, one should rather promote the concept of "balanced and adequate external input sustainable agriculture" (BADEISA).

References


UPDATE ON AQUACULTURE:
SMALL-SCALE FRESHWATER FISH CULTURE
IN SOUTH ASIA

Darrell L. Deppert*

Introduction

This paper discusses the systems and approaches to improve utilization of inland water resources in South Asia through freshwater fish culture. Improved fish culture technologies are available in the region, but the use of improved methods in the existing water resources has been slow to develop. With increasing demand, static or declining natural catches of fish, and the pressing need for more rapid production of food, increased production of fish in South Asia needs to be expedited.

By the year 2000 a projected world population of 6.1 billion people will, according to 1980 levels of consumption, require an additional 19 million metric tons of fish. If one adds to this, income growths of 2.8 percent in industrial countries and 4.5 percent in developing countries, the increased demand for fish by the year 2000 would be about 30 million metric tons (Shilo and Sarig 1989). In the past increased demand was met through increased harvests from the oceans, and from inland capture fisheries, particularly in the countries of South Asia. However, the capture landings have leveled off, and in some countries, even declined. Future fish landings from capture fisheries are likely to remain constant or decline, creating the need for an alternative source of supply such as aquaculture.

While significant increases in aquaculture production in many countries of Asia have occurred, real prices of most fish products have risen steadily over the past decade and in some countries, more rapidly than other agricultural products. This indicates a growth rate of demand in excess of the local supplies. The countries of South Asia, in particular, have a low level of resource utilization with a high potential. They are now focusing aquaculture efforts on increasing the production of export oriented, high value shrimp products and the lower valued finfish such as carp and tilapia. However, with populations increasing at 2 to 2.5 percent annually in South Asia, the need to improve the use of existing water resources through more intensive culture systems is increasingly apparent.

* Darrell L. Deppert is the Senior Fisheries and Aquaculture Specialist with Harza Engineering Company International and under contract to the Danish International Development Agency (DANIDA) in Bangladesh. The views expressed in this paper are Mr. Deppert's alone, and in no way represent the position of DANIDA nor those of Harza Engineering Company. Mr. Deppert is currently leading an effort to establish a model aquaculture extension program for Bangladesh. This includes the development of aquaculture production models for integrated semi-intensive aquaculture.
Fish Supply and Demand Situation

The Food and Agriculture Organization of the United Nations (FAO) forecasts that the total world demand for fish by the year 2000 will be 100 to 110 million tons (FAO 1990). This would be up from about 70 million tons in the mid-1980s. Trade in fish products expanded from US$1.3 billion in 1960 to over US$22 billion in 1986. With population increases in much of Asia, the pressures for an increased fish supply will be one of the highest in the world.

One example where rapid population growth is fueling an increasing demand for fish is Bangladesh, where the growth rate is between 2.3 and 2.5 percent a year. In Bangladesh, fish accounts for over 80 percent of the animal protein intake among the population, and fish is second only to rice in the diet of the poor. To maintain existing levels of fish consumption, the current estimated supply will have to be increased from around 830,000 metric tons to nearly 1.3 million metric tons by the year 2005.

Many Asian countries, in the past, depended heavily on open inland access fisheries and marine fishery for the bulk of the household supply. However, these traditional sources can no longer provide adequate output. The marine capture fisheries in South Asia are being exploited at, or beyond, maximum sustainable yields. The mechanisms for expansion, such as open water stocking of the inland capture fisheries, are still largely unproven. Quite often there has been no incentive to prevent overexploitation of the open access fishery, as the attitude of "living for today" prevails.

The open inland access fisheries, which include the large rivers, lakes, reservoirs, and floodplains, have had their potential reduced by environmental degradation, the continued improvement of capture fishing techniques, increasing competition for scarce surface water, and the development of improved flood control and drainage schemes. Another factor that leads to overexploitation is the entry of the unemployed into the fishery. These factors, along with the rapid increase in populations in Asia, and the continued strong demand for quality fish and shrimp, will generate the interest in, and need for, aquaculture as an alternative means of increasing fish production.

Comparative Advantages

The culture of fish has an advantage over the husbandry of other vertebrates because fish use less metabolic energy for movement and thermal maintenance. Fish are more efficient converters of food to flesh than most other land vertebrates. Dry food to wet weight of animal flesh gained for various vertebrates are as follows: fish 1.5:1 or less; cattle about 10:1; pigs about 4:1; and chickens 2.5:1 (Shang 1981). Therefore, production costs for fish are generally lower than that for beef, poultry, and swine. Yields of pond-produced fish in Asia under semi-intensive culture can be as high as 5,000 kilograms to 10,000 kilograms a hectare a year, compared to cattle production, which would yield only 500 kilograms to 700 kilograms a year on the same area.

In India, according to Sinha and Srivastava (1991), the return from aquaculture can be up to fifteen times higher than traditional agriculture. In Bangladesh, the financial gains from aquaculture can be up to thirteen times higher than that for agriculture, for fish only systems and up to thirty times higher in integrated fish and chicken systems (see figures 1 and 2).
Figure 1. Production Costs and Returns for Aquaculture and Agriculture in Bangladesh

U.S. $/Hectare

1. Based on 1 hectare of land area for 12 months.
3. Total farm production cost and return projections from annual farm budget summaries which includes the production of rice, jute, vegetables and fruits.

Source: Data from: Agriculture wing of the Bangladesh Water Development Board (1988).
Figure 2. Production Costs and Returns for Aquaculture and Agriculture in Bangladesh

U.S. $/Hectare

1. Based on 1 hectare of land area for 6 months.
3. Production costs and returns for one crop of HYV Aman Rice.

Status

Major Technological Advances in Aquaculture

Due to the development of induced breeding technologies, India and Bangladesh, along with other countries in Asia, have been able to expand their production of fish seed and meet the rising demands. Bangladesh has increased its hatchery produced seed from near zero in the late-1970s to more than 3 billion in the late-1980s (see figure 3). Prior to 1980, Bangladesh produced virtually no fish seed from hatcheries and producers were dependent on the supply from the rivers. But the river sources were unreliable, and it was not until the hatcheries increased that a dependable supply of fish seed could be ensured. India increased its hatchery produced seed from 1 billion in 1980 to 9.3 billion in 1987-88 (Sinha and Srivastava 1991). These increases have been possible through induced breeding. Almost 90 percent of the Chinese carps cultured in China are produced from hatcheries (Thia-Eng 1986).

Regional and countrywide improvements to polyculture models, multiharvest plans, and integrated farming programs have led to increased yield in the region. The major technological advances in aquaculture have included induced breeding of fish, shrimp breeding, maturation and larval rearing, aeration aquaculture, advances in integrated farming, improved multiple harvesting and stocking technologies, multispecies culture improvements, and sex reversal and hormone manipulation techniques, particularly with tilapia.

Current Production

According to 1988 estimates of the FAO, the value of global aquaculture production was about US$22.5 billion (FAO 1990). This includes all freshwater and marine species of fish, shrimp, other crustaceans (mollusks, oysters, mussels), seaweeds, and other aquatic plants, which total more than 14 million metric tons. This represents an increase of more than 9 million tons since 1973 (Pillay 1990).

China's aquaculture harvests far exceed that of other countries. In 1988, China harvested about US$7.95 billion worth of aquaculture products, while the total for the United States was US$609 million. Carps dominate the world production over other species groups, with Asia leading production.

Despite the advances in techniques and increases in production, there are substantial areas, particularly in South Asia, that lag behind in aquaculture development. Current levels of production from freshwater aquaculture are still low in countries such as India, Bangladesh, and Pakistan. In these countries most of the fish production takes place in the extensive category, with limited semi-intensive culture, and virtually no intensive culture. China, Thailand, and Taiwan (China) have intensified steadily and have achieved widespread higher yields/unit area. China maintains high yields on a large scale over large resource areas.
Figure 3. Estimated Total Hatchery Produced Fish Fry in Bangladesh, 1980-90

Source: Adapted from Department of Fisheries estimates in kilograms of fish hatchlings. One kilogram of hatchery produced hatchlings has been estimated at 400,000 individuals.
Future Potential

The overexploitation of existing open access fishery resources, coupled with environmental changes and degradation, will limit future supplies of fish from this traditional source. If yields can be increased, aquaculture may be able to meet the future demands for fish in South Asia.

Yield Potentials

In South Asia, existing pond water resources are not fully utilized for aquaculture. Only a small percentage is being used for semi-intensive culture. With semi-intensive techniques, existing traditional methods producing 800 kilograms to 1,000 kilograms a hectare a year, can be made to yield 5,000 kilograms to 10,000 kilograms a hectare a year. The trend for the future will have to be the improved utilization of existing resources through more intensive culture.

Potential production from India is estimated at 4.5 million tons a year while present levels are at 1.3 million tons (Sinha and Srivastava 1991). In Bangladesh, if semi-intensive aquaculture were applied, the potential yield could be as high as 0.7 million tons a year to 1.4 million tons a year in existing water bodies alone. The current estimated production in inland culture fishery is only 0.18 million tons a year (Department of Fisheries 1990).

In Asia alone, the total area used for aquaculture is estimated to be about 2.4 million hectares. According to Shang (1981), this estimate, plus other undeveloped coastal lands suitable for culture of fish, may be as much as 30 million hectares. India has water areas suitable for controlled freshwater aquaculture of more than 1.6 million hectares, and Bangladesh from 250,000 to possibly more than 400,000 hectares. In Bangladesh, much of this has a very low opportunity cost. Figure 4 shows the impact of increased yields from semi-intensive aquaculture on the total fishery production of Bangladesh. This figure demonstrates the need for an even more rapid expansion of semi-intensive aquaculture to keep up with the future demand.

Income and Employment Generation

Aquaculture is labor intensive and, at all stages, generates employment. An example of this is multiharvesting, which improves the yield and income and increases the labor requirement. Fish feed production should be encouraged instead of the use of prepared fish feeds, which require less labor and more cost. The production of duckweed, for instance, which requires more labor at lower costs should also be encouraged. Increasing employment and the use of labor for aquaculture intensification is of particular significance in those countries where the opportunity cost for labor is low.

Aquaculture has the potential to be an important generator of income and employment in the rural areas of many Asian countries. Shang (1981) estimated that the production of 4 metric tons of fish provides one full-time job and an income adequate for a family. In Bangladesh, the net income derived from the production of 1,000 kilograms of fish a year can support a family of up to eight people. Stated in another way, the net income derived from aquaculture in 0.2 hectares of water surface area, is adequate to support a family in some developing countries.
Figure 4. Demand for and Production of Fish in Bangladesh Medium Scenario for Pond Aquaculture

Thousand Tons

1. Increasing production of fish through semi-intensive fish culture in 40 percent of the existing pond resources.
Approaches to Future Development

To achieve rapid growth in aquaculture, substantial investments are required. In Bangladesh, a total investment of from US$250 million to US$500 million (simply for operation inputs) would be required to upgrade pond culture of carp from its current level of 800 kilograms to 1,000 kilograms a hectare a year to 5,000 kilograms a hectare a year. Returns can be as high as two to three times that invested as seen on figures 1 and 2, and when existing pond resources are used, there is virtually no opportunity cost. In addition to the actual investments in the culture activity, investments in disseminating the technology would be required.

Through aquaculture, it is possible for very small and poor farmers to earn high incomes from a very small resource. Future efforts of development should be directed toward helping such farmers achieve profitability and, in ensuring the success of each, to attract others. The unique advantages of aquaculture over other land and water uses have been demonstrated. Aquaculture is an economic activity which is not limited only to those with adequate funds for investment. It is well-suited to those rural individuals who lack capital and who can be motivated to earn a sustainable income. In South Asia, there are substantial opportunities for the widespread involvement of small, poor to marginal farmers, to greatly increase their incomes through aquaculture.

Opportunities also exist for medium- and large-scale farmers, both in freshwater fish culture and brackish water culture of shrimp. Opportunities exist for commercial scale production of both fish seed and tablefish. Coastal shrimp culture still offers opportunities, but operations need to be kept extensive to semi-intensive with more emphasis on lower costsakilogram of product.

Future aquaculture development can alleviate poverty and promote the development of rural areas. Aquaculture can increase employment alternatives, particularly for women; producing more fish for local consumption (that is, improving nutritional standards); raising the net incomes of rural communities; increasing opportunities for foreign exchange earnings; supplementing or replacing capture fishery catches where environmental degradation or overfishing have depleted stocks; and effectively utilizing fallow land and water resources.

Small-Scale Aquaculture and Poverty Alleviation

Small-scale aquaculture can substantially increase the household income of a family in Bangladesh from 6 percent of the total family income to 38 percent in one year of fish culture. The percentage of income from the relatively small pond area of 0.1 hectare can double if the fish operation is integrated with chicken-rearing. In most areas of South Asia, a farming family can be supported by the returns from aquaculture from 0.2 hectare of water.

In general, small-scale aquaculture operations provide more employmentaunit of capital invested than larger farms (Pillay 1990). One direction for developing countries could be the promotion of small-scale aquaculture projects for poor farmers. Working with people below the poverty line can be successful when they can be assured of a constant supply of inputs, financial assistance and technical guidance. In Bangladesh, studies show that poor farmers adopt the activity rapidly, are generally more committed to the constant care required, produce fish at higher yield levels than wealthier neighbors, and repay loans more regularly. Strategies should be followed that build a permanent, sustainable framework around the small farmer, within which he can prosper through hard work with the help of appropriate technology.
Credit

Access to credit needs to be ensured in order to reach the large numbers of rural poor who are unable to finance the costs of getting started in aquaculture. In Bangladesh, to go from extensive to semi-intensive culture in the existing pond resources, would require between US$250 million to US$500 million annually for investment, just to cover the running costs (DANIDA 1987). The current institutional lending for fisheries and aquaculture is in the range of US$3 to US$4 million (World Bank 1991).

In studies conducted as a part of the Aquaculture Extension Project in Bangladesh, more than 50 percent of the pond owners state that lack of financing is the greatest constraint to their involvement in aquaculture, and less than 2 percent have access to credit for that purpose (DANIDA 1987). The general experience with credit for small-scale aquaculture and fisheries programs in India and Bangladesh has been rather negative in terms of loan disbursements, utilization, and loan recovery (DANIDA 1987). Among the factors responsible for this, the more important ones are:

- Reluctance on the part of financial institutions to disburse loans without the borrower providing immovable assets as primary collateral, which is not possible for the majority of small-scale fish farmers in the region.

- Existing gift and grant character of loan programs where capital subsidy components, subsidized interest rates, and the "writing off" of fisheries loans has resulted in the deterioration of loan repayment motivation and discipline.

- Social interference in the selection of borrowers by locally elected bodies, which often results in people receiving loans who are neither able nor willing to use the loans for the intended purpose.

- Ineffective technical extension services.

- Lack of trained branch level staff for appraisal of loan applications and loan supervision.

- Complicated procedures and requirements for obtaining a loan, which often keeps those who most need it away.

In Bangladesh, institutional credit disbursements to the fisheries sector have declined when they should be growing with the demand (DANIDA 1987). This has been primarily attributable to the above factors. Credit programs with small fish farmers can be successful through efficient selection of the loan recipients, improved loan supervision, and the waiving of collateral. Credit provided through nongovernmental organizations (NGOs) is another way of improving the delivery to the target population.
Extension Approaches

Fish yields must be raised and the transfer of the technology accelerated. The technology must be demonstrated successfully and widely. Extension services are needed to support aquaculture development through the creation of public awareness, transfer of appropriate technology, development of support services, provision of support to private hatcheries, and greater access to credit. Farmers must be assured of the reliability of the support services and the availability of these services into the future. Programs should stress the profitability with no subsidies, because the economic returns from aquaculture are great and can be achieved within a relatively short period of time.

As an alternative to government intervention, NGOs can be effective in motivating target producers to improve aquaculture practices. Some NGOs in the region have been able to improve the fish producer’s access to credit, fish seed, technology, markets, and the water resource itself. They have been most effective in transmitting an extension message and following through with motivation and supervision to small-scale producers. NGOs should be supported and given training on all the technical aspects of aquaculture.

In Bangladesh, over 90 percent of the pond resources are underused for fish production. In an attempt to increase aquaculture within the private sector (where the ownership of virtually all this resource lies), a DANIDA-financed aquaculture extension project has developed a model for increasing fish production on an areawide basis (DANIDA 1987). This is a public sector program directed at establishing true supports to the private sector with accessible credit, practical, directed, technical guidance, and high-yielding fish and integrated fish and poultry production models, which brings net returns in one year of US$2,800 to US$7,000 a hectare over that invested.

The goal of the program is to create sustainable aquaculture development with small-scale, poor to marginal, private pond operators through the extension and promotion of a simple low-cost aquaculture production system. The program uses experienced and well-trained rural aquaculture entrepreneurs as extension agents. Project support goes to the private sector at all levels, from the primary producers of hatchery seed through to fingerling growout for stocking into terminal tablefish production ponds. The project has been able to establish sustainable rapid increases in aquaculture production in target areas of Bangladesh by (a) supporting the private sector technically and financially at all levels; (b) facilitating marketing and establishing linkages between each of the producers and their markets; and (c) extending a production system with high yields and low costs.

Research

Research emphasis in the future should come from the bottom up, and not top down. Often scientists have not been able to respond quickly enough to meet the immediate needs of the industry. In many instances, there has been little communication between the farmer and the researcher. Adaptive research should be conducted in the production of artificial feeds, using local ingredients and increasing the use of plant instead of animal proteins. Research on grow-out operations to improve existing knowledge of optimal carrying capacities under various types of feeding and water management regimes is also important. There is a need for research into selective breeding, in order to ensure constant, future supply of quality fish seed. Efforts should be made to increase regional
cooperation in Asia, with the pooling of knowledge and information to cut the costs of research and development for any single country.

**Production and Resource Utilization Considerations**

Concentration in the future should be on the following areas of aquaculture:

- Culture of species low on the food chain that can be produced in large quantities at lower costs.
- Continued development of lower cost, more efficient culture systems.
- Continued promotion of integrated approaches using fish with livestock, fish with agriculture.
- The use of relatively cheap, energy rich supplementary feeds, and the use of duckweed and other vegetation as a direct feed.
- Increased recycling of agricultural and livestock wastes.
- Localized production of feedstuffs to increase employment and allow higher returns on the investment.
- The use of multiharvesting techniques to increase outputs and improve marketing potential by spreading the harvest over time.

Approaches in the future should work toward the full integration of the aquaculture operation with livestock rearing and agriculture. The use of a wider variety of fish species, which feed on a wider variety of planktonic organisms and the higher plants, should be encouraged. The best approach for the developing countries of South Asia is in the use of low-cost systems, fueled by agriculture and livestock by-products, and with readily available, but at present unused vegetation, coupled with multistocking and harvest culture systems.

Where tubewells and reservoirs have been constructed for irrigation agriculture, the opportunity exists for high-density, high-yielding pond aquaculture systems. With the assured supply of water, the risks in intensifying the culture system are reduced while the yields of fish can be multiplied as the farmer increases his stock density, feeding, and water inputs.

Concentration for the near term should be, initially, on better utilization and development of existing areas and potential. According to Shang (1981), it costs seven times more to construct new ponds in Indonesia than to improve the existing ponds from an extensive to intensive kind of farming. In Bangladesh, the cost difference is four to five times. Many of the existing pond resources also have opportunity costs which are very low and there is substantial existing resource where the opportunity cost is at or near zero.
Involvement of Women in Aquaculture

In Aquaculture Development Programs in Bangladesh, studies show that women working on homestead aquaculture achieve higher fish yields per unit of water area than male operators in the same areas. Women are successfully producing tablefish at rates of over 5 tons a hectare a year. They are also rarely delinquent on their loan repayments. Family owned pond water resources tend to be near the homestead, providing the opportunity for women to undertake aquaculture while still carrying on with normal household activities. Women’s involvement also frees family men to pursue other avenues of income generation.

Aquaculture and the Environment

Negative impacts of aquaculture development have occurred, and are still occurring, through unplanned development of coastal mangrove areas for shrimp culture in the region. Destruction of the mangrove in Bangladesh, for example, has taken place despite the fact that extreme acidic soils lie below, causing difficulty in the culture of shrimp. In other parts of the country, there are thousands of hectares of land which do not require clearing and have suitable soils for high levels of production. The lack of adequate planning in aquaculture development and the absence of regulatory management have allowed development to proceed in areas where conflicts and future environmental impacts abound. In the future, areas other than valuable mangrove forests, which act as nursery areas for juvenile wild marine shrimp, should be developed.

Positive uses of aquaculture in mitigating fish losses from engineering interventions also have occurred in the region. One example where aquaculture was used successfully to mitigate fish losses due to an engineering intervention was in the Chandpur Irrigation and Flood Control Scheme in Bangladesh. The movement of fish into and out of a 210 square mile area, originally rich in aquatic life, was impeded by the construction of water control dikes around the entire area. To reduce the loss of fish into the area and the potential loss of livelihoods to fishermen, a fish hatchery was constructed to supply fish seed to make up for the loss caused by the engineering intervention. Fish landings of carps and shrimp did decline due to the closure but then increased to above preclosure figures in the case of fish. The increase was a direct result of the hatchery produced seed of more than 100 million annually, and an improved extension program in the area that led to an increase in semi-intensive fish culture. Private sector hatchery development in the area resulted from this investment.

Other potentially positive impacts of aquaculture on the environment have been the continued development of hatcheries and the intensification of pond aquaculture in Bangladesh and India. The increase in hatchery supplied seed has probably kept natural seed collection in rivers from intensifying, thereby promoting the potential of natural wild fish survival. Intensification of pond aquaculture has provided more opportunities for employment from the increased harvest of cultured fish to landless fishermen. To some degree, this will have a reducing effect on fishing pressure in the open access fishery.
Public and Private Sector Role

There are many examples where large public sector projects have failed to achieve their goals. In some cases they have become a burden to the countries through the unproductive use of large numbers of employees and the high cost of maintaining a large, often unproductive, infrastructure. The most productive areas of public sector intervention lie in research and development, modernized extension interventions, and policy support to the private sector.

The public sector has had an impact on the industry in the area of hatchery or seed production through demonstration. To a large extent the production of fish seed from hatcheries was started in the public sector and now, for example, in Bangladesh has been almost completely taken over by the private sector. The development of hatcheries for carp is a good example of where public sector investment was needed in the beginning to start off an activity, but where after the initial development, the private sector was able to take over and expand production. In most of Asia, nurseries have been in the hands of the private sector for some time. Currently, in most of Asia, and particularly in India and Bangladesh, the private sector has assumed the major role in carp aquaculture. This includes the hatchery, nursery, transport, on-growing phases, and of course, the marketing and is achieving significant returns at each level.

Some of the smaller public sector projects have been successful in serving as a catalyst, spurring the development of the industry by the private sector. Private sector initiatives and investments have been a strong force in the economic development of the sector over time, particularly in such countries as Thailand, Bangladesh, India, and Nepal. Related activities, such as hatchery production of fry, pond production of fingerlings, tablefish production, supply of inputs, or marketing of the product, have been more efficient, and the development far more rapid, in private sector hands, than in the public sector. The private sector is involved in all stages and has developed to a fairly sophisticated level in all areas of operation except the tablefish production stage, where in developing countries of the subcontinent, production methods are still primarily extensive. Some of the support required for future development of tablefish production can be seen in figure 5. To a large extent all the production related activities can be, and in many cases, are being carried out in the private sector.

In the future, small-scale private sector operations should be supported through public sector policies. The economic development of the rural poor through such activities as aquaculture can, and should, lead to the development of individuals who will, in future, demand and seek out services rather than having to be motivated and directed through extension, as is the current situation.

Investment Opportunities

Investments in the future are to be directed toward the improvement of water resource utilization through the intensification of aquaculture, particularly semi-intensive aquaculture in ponds. Strategic investments are needed in infrastructure and institutions. The investment support should be directed toward the continued development of the private sector. Total "Area Development" approaches, which include aquaculture, are suggested.

The specific investment opportunities lie in: (a) modernization and improvement of extension and credit, which includes support to NGOs and using women and private growers as extensionists;
Figure 5. Pond Water Resource Development Supports Required for Increasing Aquaculture Yields

Private Sector Supports
- Seedstock Production Distribution
- Pond Culture Input Availability
  - Feeds
  - Fertilizer
  - Chemical
- More Accessible Credit (Private Banks) (NGO)
- Fish Stock Insurance

Public Sector Supports
- Seed Production Research and Development
- Table Fish Production Research and Development
- Extension Motivation
- Policy Support to Private Sector
  - Marketing
  - Credit
- More Accessible Credit (Government Financial Institution)

Table Fish Producer

Pond Resource Development
- Improved Resource Utilization
- Increased Output (kilograms fish) (Nutritional Benefits)
- Increased Income
- Increased Employment
(b) small private sector hatcheries; (c) tubewell and linkage of production to reservoir supplies of water; (d) critical road and rail linkages; (e) small private sector ice plants; (f) crop insurance; (g) development of trained technically skilled personnel; and (h) adaptive "on-farm" research.

References


Introduction

Whether causally connected or linked by coincidence, many of the early criticisms of structural adjustment programs in the 1980s have become outmoded; experience has led to program reorientation. In particular in the second half of the decade the need for special attention to poverty issues induced or overlooked by adjustment programs was acknowledged widely in World Bank documents. This evolution has been noted both within the Bank (Ribe and Carvalho 1990; Ribe and others 1990) and outside it (Stewart 1991).

One component of the current approach to poverty with adjustment is an attention to investments in human capital in general and in nutrition in particular. In recent years such investments have regularly been included in structural adjustment loans (SALs) as well as in social funds that accompany some adjustment programs. These funds are, in themselves, an example of the attempt to set up compensatory programs during periods of adjustment.

These trends are easily illustrated. It is more difficult to assess their impacts. In a few cases it is appropriate to ask whether nutritional considerations are solutions searching for a context, whether they address the more accessible rather than the more pressing problems, or whether they are more political than substantial. More concretely, future interventions might benefit from continued assessment of whether explicit nutrition programs are more appropriate than broad policy considerations, whether targeted programs are more effectively implemented than broadly based measures in all environments, and whether nutrition is best promoted by food policy and food oriented subsidies or by health and sanitation programs.

Clearly this is a large agenda and the current paper does not propose to find definitive answers to all these and related questions. In part this is because many of the most interesting programs are not completed or evaluated. Moreover, the evolution of new approaches ensures that any perspective will not be definitive. The paper does, however, review the role of nutrition in recent structural and sectoral adjustment lending. Although particular attention is given to the latter, in part because the number of sector adjustment loans is increasing relative to SALs, a sharp conceptual distinction between sector adjustment and SALs is not drawn. It is well known that agriculture is

* Harold Alderman is Senior Economist, Agricultural Policy Division, Agriculture and Rural Development Department. The author is indebted to Ketki Bhagwati who was asked to do an incredibly large amount of reading in an unjustly short amount of time. The author also thanks Alan Berg, Helena Ribe, and David Sahn for helpful comments.
often affected more by changes in trade policy than by specific sectoral measures; similarly, poverty and malnutrition are not confined to a sector and solutions are not easily compartmentalized.

The main body of the paper begins with a perspective to support this latter view. A review of trends in Bank programs follows. Because these trends mask the heterogeneity of the different approaches adopted, a few illustrations are also offered subsequently. It is not possible to be exhaustive; examples are chosen on the basis of available information and the approaches that can be illustrated with them.

It is also not our intention in this paper to monitor the impacts of various adjustment strategies per se, or of counterfactual macroeconomic scenarios, on poverty and nutrition; a meaningful contribution to the evidence cannot be done en passant. We take the need to consider poverty impacts as given, or at least revealed preference, in a number of Bank policy statements. It is not difficult to find country studies which indicate reduced earnings for many of the poor over a number of years due to stabilization measures’ policies or declines in real income following food price increases. It is as easy, or easier, to document examples where the opposite has occurred. It is not yet possible, however, to find cases that show that economic recovery has made consideration of nutrition interventions redundant.

It is of interest, then, to review how these considerations have led to action. Moreover, the discussion draws the distinction between changes in welfare as measured by income and those indicated by nutritional impacts. Many economists argue that the former is the most appropriate welfare measure, but society in general and policymakers in specific often have greater tolerance for inequality of income than of food or health maldistribution (Tobin 1970). Specific attention to nutrition by policymakers reflects both consideration of long-term investments in human potential as well as immediate concerns of public support for adjustment measures and provides additional rationale for the specific focus of the study.

Conceptual Framework: Policy Levers to Influence Nutrition

A first step in considering the linkage between adjustment and nutrition is to recapitulate the pathways between policy and nutritional outcome. A prevailing model of health and nutrition production is based on the same approach used in modeling production and consumption choices in agricultural households (Singh, Squire, and Strauss 1986). In this approach utility is derived both from purchased goods and home produced goods including health and nutrition (Schultz 1984). Some of the inputs into the production of nutrition and health provide no direct satisfaction, that is, are not consumer goods themselves. Others, such as food, are desired both for their impact on health production and for the direct utility they provide. A household is constrained both by its budget and the available health technology in determining its investment and consumption choices. The technology constraints are relaxed as information is acquired and new processes are devised. The budget constraint reflects returns to assets and market prices (including wage rates). Regarding health and nutrition, one needs to consider not only food prices but the price of obtaining health and sanitation services. Both the quality adjusted price of services and the stock of knowledge reflect public investments over a number of years.

A number of implications for the adjustment process can be derived from this basic model. First food is only one input into the production of better nutrition. Changes in food supply change food consumption through their impact on prices; this is a distinct pathway from the change of food
demand through changes in income. Moreover, even when food policy diverges from a narrow definition of agricultural policy by focusing on consumption as well as production, it is not synonymous with nutrition policy. Complementary inputs of health and sanitation as well as education often determine the success of nutritional strategies.

This bears on a second point. While family income may be an important determinant of nutritional status of the household, changes in income may not always lead to corresponding changes in nutritional status. Not only are impacts mediated by aggregate household responsiveness and intrafamily distribution, but also nutrition production possibilities are influenced strongly by the availability of public goods. Modest increases in household income generally do not change the availability of quality health care or the ability of a household to live in a sanitary environment.

Third the nutritional status of a population often responds slowly to changes in the economic environment. Household consumption is buffered from short-term income changes by savings, credit, and other coping measures. These, however, become less adequate over time and when shocks are correlated throughout the community. Similarly, changes in net investment in health or education have a cumulative, but lagged, impact on the availability and quality of health infrastructure and on the prices that a family faces.

Fourth the technological frontier in health, as in agricultural production, is partly a function of these lagged investments. In general the stock of knowledge does not deteriorate rapidly, although its dissemination may. Nevertheless, the rate it is accumulated slows when health investments slow.

These latter two points help explain why there is not a strong immediate link between adjustment processes and measures of nutrition and health at the national level, even in those countries where poverty can be shown to have increased and public investment in health to have declined. Downward trends in infant and child mortality rates or levels of malnutrition which were observed in Latin America through the 1970s did not in general reverse in the 1980s despite the widespread economic contraction that accompanied adjustment. Nor did the crises that preceded economic restructuring in Africa halt the improvement in life expectancy in that continent.

Over time, however, the cumulative impact of reduced school enrollment or an inability to maintain investment in infrastructure or a household’s exhaustion of its financial reserve would be expected to show in health statistics. Available data, however, generally are insufficient to estimate the extra deaths from a slowdown in these rates of improvement, nor the distribution of changes in mortality over subregions. Nevertheless, such a potential cumulative impact provides one justification for including attention to human capital investments in adjustment programs.

**Approaches to Nutrition in Adjustment Lending**

**Trends in Program Objectives**

One of the most detailed analyses of the consideration of social impacts in adjustment lending is presented in Ribe and Carvalho (1990). This section follows that study in attempting to summarize a large body of Bank lending in a few matrices. It differs not only in the years of coverage, but also by its particular focus on nutrition and food policy as well as by its coverage of social funds along with two types of adjustment lending, SALs and agricultural structural adjustment loans (AGSALs). Anyone acquainted with a single project in the three tables which follow will note the degree of
abstraction and judgment calls necessary to construct such tables; appraisal reports are not a substitute for familiarity with a specific project. To some degree this limitation is countered in the specific illustrations which follow.

Looking first at AGSALs (table 1), one notes that roughly one-half of the total number of programs between 1983 and 1991 include an explicit consideration of nutrition. However, only 20 percent of the loans prior to 1987 have a nutrition component, while virtually all of the programs since 1987 do. One exception, Tunisia, includes the targeting of food subsidies as part of its 1988 SAL and its 1992 economic and financial reform program.

While recent SALs do not have as many explicit mentions of nutrition, there has been a clear tendency since 1987 to include poverty programs targeted to low-income households, or regions and employment categories believed to be associated with low incomes (table 2). Roughly one-third of the loans since 1987 (inclusive) explicitly address nutrition, while two-thirds have targeted poverty programs. To a degree this may be the result of a change in format; appraisal documents prepared since 1985 rarely fail to include an explicit section on social impacts from which it is comparatively easy to discern the specific poverty alleviation measures. Nevertheless, even assuming that some of the earlier SALs contained targeted poverty measures that were omitted in table 2, it remains apparent that in the first half of the 1980s, macroeconomic stabilization was addressed in relative isolation from specific poverty programs compared to later years. Social issues were not necessarily ignored; public expenditure reviews accompanying many SALs often stressed health and education investments (Sahn 1992). Similarly, many SAL documents stress that price policy and marketing reforms, including trade policy, would remove biases against middle-income, and often low-income, producers. However, specific programs to deliver services or to target employment creation were seldom delineated. For example, none of the eight loans prior to 1987 that plan for a removal of generalized food subsidies mention targeting or other compensations to low-income households.

The contrast between earlier and later SALs is not only a sequencing of policy measures that begin with fiscal and trade reforms and progress to interventions on a more microlevel as steps toward macroeconomic stabilization are achieved. Targeted poverty measures and explicit consideration of nutrition are slightly more likely to occur in first SALs in 1987-91 than in second or subsequent SALs.

Many of the more recent loans address poverty by means of a complementary social fund or social action program. Such parallel funds have the potential to address poverty and its manifestation in high mortality rates and levels of malnutrition without scaling back or redirecting the reform program. Virtually all of these funds have some explicit nutrition programs as well as targeted programs aimed at raising incomes (table 3).

Another difference between earlier SALs and more recent ones is apparent in the manner in which reforms of food subsidy programs have been handled. As mentioned earlier SALs seldom included compensatory measures when generalized subsidies were reduced. Since 1985, however, targeting of subsidies has been addressed even when the main motive of the reform is to relieve pressure on the exchequer more than to provide additional resources to the poor. Note that there are some, but not many, examples of a targeted subsidy program being designed where a general subsidy was not being scaled back. The substitution of a targeted program for a generalized subsidy is clearly more efficient from the perspective of aggregate social welfare. Poor households, which were originally in the program, however, do not necessarily receive significantly more resources than they had previously, although they receive more than if the subsidy was to be removed across the board. Moreover, in a number of programs, reforms of generalized subsidies have led either to an increase of resources for each recipient or to an expansion of subsidies to bring additional households into the transfer programs. Examples include Mexico and Jamaica in table 1 and Venezuela in table 2.
Table 1. Nutrition Action in AGSALS

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Note: x Indicate presence of corresponding program in the loan design.
xx Complementary social action program supported by the World Bank.
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**Note**: x indicates presence of corresponding program in the loan design.
xx Complementary social action program supported by the World Bank.
b Income-based safety net.
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*Note: x Indicate presence of corresponding program in the loan design.*

*xx Complementary social action program supported by the World Bank.*
**Design and Implementation**

Such subsidy programs are a prevalent component of a number of AGSALs and SALs. Implementation, however, remains tentative. For different, largely political, reasons the plans for targeted subsidies in Ecuador, Somalia, and Morocco in table 1 were scaled back.\(^{11}\) No mention of targeting occurs in Nepal's second SAL nor in the project completion report for the first SAL.\(^{12}\) Similarly, Tunisia's reform schedule (table 2) was revised, although not abandoned.

While a global review of subsidy programs would indicate that a number of programs reach rural populations (Alderman 1991b), rural market channels are such that it is comparatively difficult to design targeted consumer subsidies to reach this sector. A number of the subsidy reforms in table 1 are designed to protect the urban poor while agricultural incentives are improved.\(^{13}\) With a few exceptions such as Mexico, which includes a package of food aid and complementary health services in its pilot program, AGSALs meet the needs of the rural poor through income generation or increased availability of food in deficit areas. For example, although Mali's adjustment plan calls for a reorganization and reduction of the agricultural marketing board (OPAM) the office retains the responsibility of marketing grains in deficit areas. Mali's AGSAL also includes food for work programs linked with an early warning system to monitor emergency conditions.

At times the approach to food security in AGSALs is indirect and linked mainly to aggregate supplies, rather than income. In the Mali example, it is the open market operation in grains more than targeted programs that is expected to address food security. Tanzania's AGSAL anticipates that market liberalization will both raise producer prices and lower urban consumer prices. Rural households, which are net purchasers of grain, are expected to benefit only through sectoral expansion.\(^{14}\) Similarly, Malawi has addressed food security indirectly. Its first AGSAL argues that food security for the poor would be protected by the retention of fertilizer subsidies; the performance audit, however, acknowledged that this was a flawed concept as few small farmers benefited from the subsidy. In Malawi's second loan, food deficient households were to be targeted for agricultural credit.

Tanzania, however, also directly addresses nutrition and rural health care delivery through its complementary social plan. While this particular plan is not included among lists of social funds and action plans in table 3 as it is not a Bank initiative, it receives a portion of its funding from the International Development Association (IDA). As such, it is an example of auxiliary programs planned in conjunction with other reforms.

The role of similar plans and funds is illustrated by the 1991 SAL for the Arab Republic of Egypt, a comparatively late addition to the roster of countries that have undergone major economic adjustment. As with Tanzania, no component of that loan addresses social policies, although a contemporaneous social fund was drafted precisely to deal with this issue. In this particular example, the resources for the social fund exceed that in the SAL; the latter is for US$300 million while the former is expected to exceed US$550 million including over US$400 million in cofinancing.

Such funds are based on a model first tried in Bolivia (Jorgensen, Grosh, and Schacter 1991). A characteristic feature of social funds is that they attempt to be quick disbursing and institutionally innovative means to address poverty and its manifestations. Often they rely on nongovernmental organizations (NGOs) for program design and implementation. They differ from social action programs such as Tanzania's or Ghana's Program to Mitigate the Social Costs of Adjustment (PAMSCAD) primarily in that with social funds the Bank negotiates the criteria for subprojects but not the projects themselves (World Bank 1991b).
The core of most of the funds and social plans reviewed is employment generation with nutrition interventions often being small and unimaginative. For example, only 2 percent of the social fund for Egypt is devoted to increasing the capacity for targeting subsidies and services. Another 8 percent is earmarked for community development, including immunizations, childcare, maternal nutrition, and literacy. Over one-half is devoted to public works, with a priority in poverty areas, and another 20 percent to expanding small enterprises.\textsuperscript{15}

Of course a small share does not necessarily imply low impact; the pilot food coupon program in Honduras was budgeted for only 0.7 percent of the social fund, yet initial field visits indicate that both components (school- and clinic-based delivery systems) have proven that the mechanisms are feasible. In addition, the distribution of coupons as a means of income maintenance appears to have promoted utilization of clinics and school enrollment.

Performance on social plans is often uneven, partly reflecting the range of implementing agencies. Poor communities often can not make their demand for nutrition sufficiently apparent to become a priority among the wide array of programs. For example, a number of components of Madagascar's Economic Management and Social Action Project, such as malaria control and employment generation, were inaugurated successfully. This was not the case with the various subcomponents for food security. The slow start was in part because the plan did not have the opportunity to draw on subsequent global experience that helped clarify long-term objectives from transitory needs. However, this was exacerbated by the disinterest of the cell within the ministry of agriculture charged with implementation.

**Improving Data and Analysis**

A number of nutrition components in the various funds as well as in the SALs and AGSALs are pilot programs or studies. In many countries the information necessary for poverty targeting or for choosing program priorities is lacking. In others, there is a need to gain administrative experience before a large-scale intervention can be successfully operated. Thus the food coupon initiative in Honduras is designed to assess the logistics of a larger nationwide 3-year distribution program. Similarly, Mexico's rural pilot nutrition project or the study incorporated in Kenya's AGSAL are clearly designed to provide information on the need or feasibility of more widescale interventions. It is too early to know whether the majority of the pilot programs and studies will lead to sustained programs.

Grosh (1990) indicates that survey data have the potential to feed directly into reforms stipulated in adjustment programs. This indicates a capacity, although to date there are few examples of close ties between data generation and program design. While the data collection and analysis designed to construct poverty profiles may result in useful tools for ex post assessment and for second generation efforts, they often work under different timetables than the appraisal missions. For example, the survey that is one of the few poverty projects in Burkina Faso's 1991 SAL could not realistically be expected to assist the targeting of the nutrition programs that are central to the proposed 1992 AGSAL. In this particular example, the difficulty is inherent in the gestation of a survey. However, in a number of cases, timetables have been unrealistic. Moreover, for institutional reasons, which vary from country to country, data analysis is not closely linked with policy formulation. For example, Mauritania's living standards survey initiated in 1988 has yet to be used for the food aid targeting listed in AGSAL. Similarly, the survey listed in Mali's 1991 SAL has been postponed, in part, because the country has a backlog of unanalyzed data from other projects.
Will the emergency social plans outlast the learning stage? One might extrapolate from the initial, or pilot, social fund; Bolivia's Emergency Social Fund (ESF) was planned with a sunset or "Cinderella" clause to terminate the program after three years. Ultimately, however, a Social Investment Fund (SIF) was established to build on the experience of the ESF. Unlike its predecessor, however, the SIF is to concentrate on health and education rather than employment generation.

The transition contains a challenge likely inherent in similar programs. One factor that contributed to the successes of the ESF was that it was outside of normal government channels (Jorgensen, Grosh, and Schacter 1991). Skillings, Marc, and Makonnen (1991), however, point out that the institutional autonomy of the ESF may pose problems for the transition to the SIF, especially because the pay scales differed from normal government service. Similarly, the reliance on NGOs, a feature of social funds as well as many social plans that complement SALs, may work at cross purposes to any objectives of a SAL that include upgrading institutional capacity within a government in so far as efforts are diverted from the latter.16

Case Studies

Mexico (AGSAL I and AGSAL II). In many respects Mexico's experience with adjustment in the 1990s is the archetype of structural adjustment. Beset with both interest rate and terms of trade shocks and burdened by inefficient state-owned enterprise and a protectionist trade structure, the country had much to adjust. By many measures the process has been successful; by many others the transition has also been difficult for the population. For example, official gross national product (GNP) per capita declined cumulatively by 12 percent between 1981 and 1989. Industrial wages declined by 50 percent. Per capita social (health and education) spending declined by 30 percent in 1983 alone and failed to make up that loss in the ensuing years in the decade (Lustig 1991). One component of fiscal reform was a reduction of generalized food subsidies, particularly those on maize and maize tortillas. Existing for over a decade prior to the macroeconomic crises and costing over 1 percent of GNP in many of those years (Lustig 1986), these subsidies were untargeted but primarily accrued to the urban population. As such they had little impact on the poorest groups in the country (Lustig 1986).

One objective of the 1988 AGSAL was the elimination of global subsidies and the establishment of a targeted food subsidy distribution. The loan also had as conditions for second tranche disbursement the undertaking of a study on the expansion of nutrition programs and a pilot introduction of subsidies in rural areas. Most noteworthy, this pilot explicitly addresses sanitation and nutritional knowledge as well as food availability in keeping with the broad approach to nutrition referred to in the conceptual framework. The specific focus on nutrition was continued in AGSAL II with an evaluation of food and nutrition programs and agreement on an action plan conditions for second tranche release.

Some indication of the effectiveness of these measures can be found in table 4. While generalized subsidies were reduced briefly in 1987, the basic marketing structure was not reformed and the subsidies persisted. Targeting on the basis of income, however, was implemented in 1986 and restructured in 1991 (figure 1). Since November 1990, the growth of the means tested tortilla distribution (based on family income under twice the minimum wage) has been achieved with the expansion of the program into smaller cities.17
Table 4. Mexico: Government Expenditure in General and Targeted Subsidies
(As percent of gross domestic product)

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**Note:** * Unofficial projections based on conversions with officials at CONASUPO and Leche Industrializada CONASUPO (LICONSA).

**Source:** Compania Nacional de Subsistencias Populares (CONASUPO), Direct information.

General subsidies correspond to subsidies in grain and oilseeds.

This ambitious and apparently successful program reorientation can be used to illustrate a number of points about nutrition components of adjustment programs in general. First the program indicates that an AGSAL can be used to address fiscal reforms (subsidy reductions) and improved urban targeting, addressing objectives often considered the domain of a SAL. Conversely, similar program objectives included in SALs, for example those in Tunisia, could be justified in an AGSAL. Food consumption need not be relegated to agriculture, nor are subsidy issues strictly the concern of finance ministries. Recent social funds often linked to SALs, of course, can bridge between the two, but the placement of targeted subsidy programs in SALs or AGSALs still depends on individual initiatives as well as institutions.

Second the mechanism of loan preparation often serves the function of explicit conditions. The policy objective of shifting from general to targeted subsidies was largely achieved before the appraisal of AGSAL I. Similarly, the reform of the tortilla program in 1990 preceded the effective date of AGSAL II by more than six months. However, this does not imply that the same reform timetable would have occurred without the process of loan preparation and negotiation as well as the provision of technical assistance.

Third from a managerial standpoint, it is easier to change administered prices (including macroprices) than it is to design a compensatory program that reaches millions of families. Major trade and macropolicy changes occurred before a targeted subsidy program reaching most of the urban poor could be implemented. Logistics, as much or more than will, has meant that programs to directly reach the majority of the rural poor will take even longer.

Fourth the Mexico example, as well as a number of other programs in the region (Selowsky 1991; Grosh 1990) illustrates that it is possible to design programs to protect vulnerable groups without modifying the basic macroeconomic and structural reforms of the economy.
If one seeks to construct a typology of adjustment programs, that of Ghana is unlikely to be classified in the same category as Mexico. As in a number of adjustment programs in Africa, stabilization, in the sense of an economic contraction, was not part of Ghana’s recovery program; the economy had contracted prior to the adoption of reforms. For example, the country had neither the creditworthiness to be sensitive to an interest rate shock nor the foreign reserves to maintain a trade deficit. Massive devaluation shifted economic rents and allowed price signals to allocate resources more efficiently, but it was followed by an increase in the volume of imports. Similarly, net government expenditures on health and education rose regularly after the adjustment program began. Other differences with stabilizations in Latin America can be illustrated, but it is sufficient to point out that there are comparatively few “new poor” in Ghana. Poverty is not a result of Ghana’s adjustment policies; it is, nevertheless, their challenge.

As originally designed in 1987, PAMSCAD had twenty-three subprojects budgeted at US$83 million. Only a few of these were directly tied to adjustment conditions. For example, four subprojects were designed to provide retrenched government employees with a compensation package.
as well as with training and counseling. Another provided food aid if the redeployees resettled in agriculture. The majority of the programs, however, were not really intended to mitigate impacts of adjustment so much as to ensure that significant groups were not bypassed by economic growth.

As with a number of social funds, programs for employment generation are at the center of PAMSCAD. Public works components were designed to be labor intensive. Similarly, a food for work project was targeted to the savannah belt, a region known to be the poorest in the country and one which has few exports (either crops or minerals) that would benefit rapidly from devaluation.

Nutrition was directly addressed by means of a supplementary feeding program distributed through health centers. Geographically targeted to two districts in each of the twelve regions in the country, the program is designed to reach 24,000 mothers and young children. The program began initial distribution in January 1990 in two regions. Most noteworthy, this program did not appear in this form in the original PAMSCAD proposal. Little in the project preparation considers the worldwide record of supplementary feeding programs in order to innovate and preempt problems observed elsewhere.

As already discussed some motifs that apply to other complementary social plans can be illustrated with this example. First the package is based on cofinancing from various donors although some components were financed directly by the government of Ghana. The necessity to raise such funds delayed implementation, often by more than two years from the initial proposal. Disbursements in 1988 and 1989 were less than 40 percent of plan. It appears that not all the funds, and the projects, were additional. To some degree, for example, the supplementary feeding program replaced distribution by NGOs.

Second the initial proposal was drafted swiftly and in a relative information vacuum. For example, the Ghana Living Standards study did not complete its first round of data collection until September 1988. A similar demographic and health study was not conducted until the following year. Neither study was designed to provide reliable data at a regional, much less a district, disaggregation. Given that a correlate of underdevelopment in services is often underdevelopment in statistics, it is frequently necessary to trade off some statistical precision in order to attempt the degree of disaggregation that is often required for program design.

Third although the proposals were prepared in conjunction with the SAL (4 years after Bank supported adjustment efforts were inaugurated) actualization of the plan was delayed. This reflects both the funding delays mentioned already and administrative capacity. This supports the view that the program was less mitigation of adjustment induced hardships as a program to address preexisting and persistent social problems. It also underscores the need for considering planning capacity and the number of new initiatives in social plans and funds.

Fourth the poverty alleviation motive is not incompatible with a second motive, that of political considerations. The decision to have distribution of supplementary feeding in each region is likely to maximize visibility rather than to address the most pressing nutritional problems. This also likely explains PAMSCAD and World Fund Program (WFP) support for 80,000 boarders at secondary schools or why a significant component of Bolivia’s ESF was addressed to needs of miners. This need to create a political consensus is not unique to Ghana, nor does this need rule out that a program to address poverty may additionally serve political concerns.

Fifth while community involvement often enhances program design and implementation, it occasionally works at cross-purposes to poverty targeting. The supplementary feeding program includes assistance to communities in constructing nutrition centers. Some poor communities were unable to raise funds to build these centers.
Conclusions

There is little doubt that experience, often reflected in a mirror held by critics, has led to a broadening of the types of poverty programs included in SALs and AGSALs. It is now the exception when a SAL or AGSAL fails to consider programs directed at poverty alleviation or to be explicitly linked to social programs which do so. By design these programs are diverse. Quite often they are specifically linked to nutrition, either as an objective as in Mexico and El Salvador, or as an indicator of groups toward which income generation programs should be targeted as in Mali.

In many cases in which poverty is addressed in an adjustment program, income generation is both a means to an end as well as an end in itself. Targeted poverty programs often are designed not only to reinforce the political consensus for economic restructuring, but as temporary measures to maintain living standards until a sustainable economic base is established. Adjustment lending always sought income generation as an end; it is viewing it as a means that is an innovation.

Under this perspective--implied if not actually stated as such in a number of recent Bank documents including the Poverty Handbook--one need not address the question of whether nutrition should be an objective distinct from poverty alleviation. Whether or not an adjustment program creates new poverty, social investment in health and nutrition as well as education are being seen increasingly as a means to further economic reform as much as an objective. Income generation projects, however, remain more prevalent in the programs reviewed than are programs aimed at enhancing health and nutrition. While this study cannot directly assess the specific considerations which underlay this project mix, we can note that the choice of where and how much to allocate to income generation as opposed to service delivery is rarely decided on the investment potential of each, a question which is distinct from which measures are more suited as welfare indicators.

To amplify, public works and other employment programs may provide both a short-term income transfer as well as an increased capital stock. Moreover, the same can be said for nutrition projects. In both cases the emphasis between current consumption and investment is affected by program design. With nutrition and health projects, however, rates of return are computed less easily. This, along with the view that a money metric is the least ambiguous measure of welfare, may then account for the emphasis on income transfers in SALs and social action plans.

Even within the subset of poverty programs, which explicitly emphasize nutrition, there is a stress on implicit income transfers through food pricing and food distribution. To be sure, this has a greater impact on human capital than an approach that assumes an overall supply of food or overall economic health will automatically reach the poor. Nevertheless, this approach, that separates food policy from health policy, misses some comparatively easily obtained synergisms. These synergisms occur both in the process of combining inputs to produce a nutritional outcome as discussed above, as well as in program design. Can agriculture sectoral adjustment, which is shown to be able to design targeted-based as well as marketed-based approaches to food policy, cover complementary health inputs? Or is this overburdening the administration structure? An AGSAL, however, need not be solely tied to a ministry of agriculture. The Mexico and Jamaica examples illustrate the link between food policy and health care service delivery within an AGSAL; Burkina Faso’s planned program will likely show that similar efforts are possible outside of Latin America.

In addition to the few AGSALs, which include health with food subsidies in rural areas, there are a number of specific programs already being undertaken that indicate the potential for synergism of health and nutrition with agriculture. For example, rural credit has been linked with nutritional monitoring and educational programs. Elsewhere extension and promotion of new crops has been linked to both the private sector production of weaning foods and to distribution through clinics.
Some of these and similar projects are covered in Kennedy (1991). Clearly there can be no categorical statement about which programs that link nutrition to agriculture or to employment generation are appropriate in an AGSAL or a SAL, but there are enough successful examples to indicate that sectorial pigeonholing is an unnecessary limitation.

Similarly, social funds and related action programs often are sufficiently comprehensive to address both income generation and the delivery of health services; the latter often, but not always, including nutrition. Social funds, however, often face tradeoffs between short-term and long-term objectives. This not only often runs a risk of failing to achieve sustainable institutional capacity for service delivery, but also poses a challenge for program design in the short term. While experience in Bolivia and Ghana indicates the potential for tying social programs to successful adjustment lending, it also indicates that targeting service delivery to the poorest regions and the poorest families within such regions is a time-consuming process. This does not argue for delays in project initiation but rather for the recognition of gestation periods in project planning. Similarly, given the challenge of reaching the poorest, interim programs need to consider broad targeting as a provisional step toward more narrow targeting. That is, if a narrow but deep safety net will miss many of the poor given initial institutional capacity, a broader, albeit shallower, safety net might be considered.

The challenge of reaching the poorest also points to one of the biggest shortcomings in current programs. A number of programs have been plagued by an underutilization of existing data and significant delays in the planned generation of new information. The potential for improved program design using integrated household studies and more rapid censuses has been demonstrated in a few cases. To date, however, weak links between researchers and policymakers, inside the Bank as well as within governments, has meant that the potential has rarely been achieved.

Unrealistic timetables are a disservice for program design. An accurate assessment of the time for survey preparation, counterpart selection and data analysis can be derived from multicountry experience. It is unlikely that a survey initiated in a SAL or AGSAL will be available for prior project design in later phases of that loan. The survey, however, can be considered as any other infrastructure investment, useful for future work as well as for ex post program evaluation and improvement.

This does not mean that countries need wait until second or third adjustment loans to initiate programs to address either acute or chronic poverty as has been the case in a number of African countries. Project appraisal takes approximately 18 months or more. If social investment is considered from the onset of the appraisal cycle, existing data as well as rapid assessments commissioned as part of the appraisal process can provide the foundation for a number of nutrition projects and interim poverty measures. In this manner a poverty alleviation plan can be in place when the first adjustment measures begin to affect the population. Similarly, the sequencing of measures can be incorporated into program design as adjustment becomes long-term development.

Proper planning and implementation implies recognizing the difference between addressing the needs of the new poor and of preexisting structural poverty. Regarding the former, a decade of experience in adjustment lending should provide guidelines to assess which policies, both macro and micro, have immediate impact on nutrition and poverty and for which impacts are lagged. There is also a need to avoid the temptation to foster rent seeking under the guise of compensation. For many policy changes such as the removal of generalized food subsidies, the magnitude of the impact on subpopulations can be calculated prior to implementation. An adjustment agenda can then initiate reforms and compensation to the poor, at a size commensurate to the added need, under the same timetable.

On the other hand, programs to address preexisting poverty need a different timetable; not a different starting point but a different horizon. Given that this task requires sustainable programs more attention needs to be devoted to administrative capacity. Adjustment lending serves the function
of putting such programs explicitly on the agenda as well as establishing momentum. Sectoral and other lending can then build on this momentum.

Endnotes

1. This emphasis is also indicated by operation lending. Nutrition lending in 1992-94, exclusive of those included in adjustment lending, is scheduled to be 120 percent higher than the previous 3 years.

2. Stewart, for example, contends that redesign of the adjustment package might be more appropriate than the addition of poverty alleviation compensations.

3. Recent reviews are available in Alderman (1990) and in Behrman (1991). Both reviews also discuss the empirical evidence on the impact of price changes on nutrition; while price changes for one food item often lead to substitution of other foods, overall nutrition is nevertheless affected by price movement.

4. See, for example, Lustig (1991) and also Hoffmann (1991).

5. Where data are good, however, one can often find a deceleration of the rate of improvement. For example, Chile which has excellent monitoring capacity and has achieved low mortality rates, had short-term increases in malnutrition and mortality in 1983 and 1986 (Castaneda 1991).

6. See, however, Macedo’s data on Sao Paulo (Macedo 1988).

7. Other studies of a similar format include van Blarcom (1991) and Skillings, Marc, and Makonnen (1991). See also Selowsky (1991).

8. The increased emphasis on targeted programs is discussed in Ribe and others (1990) as well as in the Poverty Handbook (World Bank 1991b).

9. Skillings, Marc, and Makonnen (1991) review such programs. Some of the programs in their study are freestanding projects or otherwise additional to SALs, while others are components integral to the adjustment package (such as in the proposed AGSAL for Burkina Faso). The listing here takes a somewhat broad definition of social funds and complementary social programs.

10. An illustration comes from a proposed reform in Algeria. The reform will decrease food subsidies by 27 percent with households in nine deciles having a net loss in welfare. The lowest decile, however, is projected to receive a 16 percent increase of transfers.

11. The reforms of grain subsidies in Morocco did move ahead, but those on sugar and edible oil were postponed.

12. The limited food subsidies that remained in 1989 went primarily to civil servants and secondarily to transport grain to remote areas (World Bank 1991a).
13. Madagascar's urban rice subsidy does not appear on the matrix; the AGSAL planned for it to be maintained but neither targeted or expanded. In any event its implementation was flawed (Dorosh, Bernier, and Sarris 1991).

14. In a number of cases in Africa, however, market liberalization has reduced rural as well as urban prices. This is not necessarily in conflict with objectives of raising incomes because procurement taxes would also be reduced. A full analysis depends on an understanding of the relationship of marginal (often parallel) prices to official prices.

15. To a large degree, the explicit consideration of nutrition and community development was a product of a tacit alliance between Bank staff members, NGOs, and the Ministry of Social Affairs. That is, the process of designing the program strengthened the position of a relatively less powerful ministry.

16. Anecdotal evidence suggests that NGOs recruit some of their staff from government ranks. If so, one problem would be the need to offer competitive salaries. Another is the potential for revolving door contracting.

17. An optically readable smart card and computerized tracking system was installed in mid-1991.

18. The Mexican AGSAL is particularly interesting because the subsidy administration is under the Ministry of Trade and the design of the rural pilot health project as well as the evaluation of subsidies is under Solidaridad, within the Ministry of Budgeting and Planning. In other contexts, the inherent difficulty in forging interministerial linkages has delayed implementation of food subsidy reforms, for example, in Morocco's AGSAL.

19. The rural pilot project indicated in the 1988 appraisal report for the first AGSAL began distribution of food and expansion of services in late-1991. Similarly, Morocco was able to redirect its wheat flour subsidy fairly easily toward a grade consumed primarily by the poor, both those in rural as well as urban sectors but was less successful in implementing the school- and clinic-based feeding programs in its SAL.

20. This section draws heavily on Alderman (1991a). It is supplemented by the report of a World Bank review mission in October 1990.

21. A deworming program which may have nutritional impacts was also included in PAMSCAD.

22. The supplementary feeding program is not financed by the World Bank.

23. Shortcomings of geographic targeting in Bolivia's social fund are discussed in Jorgensen, Grosh, and Schacter (1991). The authors, however, conclude that short cut methods can go a long way.

24. This poses a major methodological challenge, one that is inherent to a range of human capital investments.

25. Less than actual earnings by the amount the laborer would have earned in lieu of participating (Ravallion 1991).
References


NONGOVERNMENTAL ORGANIZATIONS
PRIVATE VOLUNTARY INITIATIVES:
Enhancing the Public Sector’s Capacity to Respond to Nongovernmental Organization Needs

Anthony Bebbington

and

John Farrington

During the past few years a number of authors have argued that agricultural and rural development strategies would benefit from increased collaboration between government organizations (GO) and nongovernmental development organizations (NGO) (Carroll 1992; de Janvry and others 1989; Farrington and Biggs, 1990; Jordan 1989; Korten 1987). At the same time, multilateral agencies have begun to call for more NGO involvement in programs that traditionally have been the preserve of, or at least always implemented through, the public sector (World Bank 1991a,b; Farnworth 1991; IDB, 1991).

We begin this paper by taking a critical look at these statements, pointing to divergences of opinion that seem hidden behind different authors’ use of similar terminologies. We then consider how such collaboration might address some of the constraints on NGOs’ contributions to rural development and democratization. From this we move on to discuss the very real achievements of NGOs in agricultural and rural development, and how these might be drawn upon in public programs through interinstitutional contacts. We close with a discussion of the implications for the institutional organization of agricultural development in the 1990s.

A Curious Convergence of Interest: An Introduction and a Caveat

If we look a little more closely at the different calls for NGO-government collaboration, several characteristics of these statements seem significant.

First the interest in increased NGO participation in public programs has been inspired by a number of economic and sociopolitical trends that are visible in much of the developing world. The sociopolitical trends are the steady rise of grassroots movements with significant degrees of self-management potential (Slater 1985; Annis and Hakkim 1988), and the slow but steady installation of the processes of formal electoral democracy. The economic patterns are the fiscal and administrative crises of the state, and the structural adjustment programs that have been pursued to address these crises.²

* Anthony Bebbington, Research Fellow and Joint Coordinator of the Agricultural Research and Extension Network, Overseas Development Institute, and John Farrington, Research Fellow and Joint Coordinator of the Agricultural Research and Extension Network, Overseas Development Institute.
These changes give rise to two parallel, simultaneous trends: grassroots movements and civic associations are demanding more participation in the development process, and more control over how it affects them; and the state increasingly needs them to take a more active role in development because it can no longer afford to, or is being dissuaded from, performing a full range of social and development services. Thus both state and civic associations are interested in NGOs playing a more prominent role in development. The point, though, is that their reasons for this common interest differ. Although civil society is demanding such political concessions as a right, the state has sometimes given them out of economic necessity rather than political willingness. Indeed, several writers have gone so far as to argue that it is only because the state's financial resource base has been eroded severely that it has begun to offer grassroots groups and NGOs more participation in decisionmaking as a political concession in the absence of the economic concessions previously used as means of gaining support (Fox and Gordillo, 1989; de Janvry and others 1989).

Political tensions thus surround the issue of NGO involvement in government programs. These political uncertainties are aggravated further by the fact that in many cases the return to democracy "has frequently been more formal than real" (de Janvry and others 1989), has been stronger in urban areas than in the countryside (Fox 1990), and even in its limited form, reform is opposed by many interests inside and outside the state (Fox 1990).

A review of public sector management reforms under structural adjustment loans (SALs) shows why such political uncertainties are important. The review concluded that "political factors are enormously important to institutional reform in SALs" (Nunberg 1988, p. vii-viii) and can frequently obstruct reforms and cause problems, particularly as regards the relations among "actors and institutions that are critical to the reform process" (Nunberg 1988, p. 25). Given the social history of many NGOs, born in opposition to repressive and authoritarian regimes, or in criticism of corrupt and inefficient GOs (Lehmann 1990), these factors will be at least as important as functional complementarities in shaping GO-NGO relations in agricultural development, especially given the context of SAPs and public sector cutbacks (Bebbington 1991b). Nunberg's lament that these political factors have been given far too little attention in SALs (Nunberg 1988, p. 25) underlines the importance of considering them in proposed GO-NGO collaborations.

This gives particular significance to the second observation: the bulk of these statements give insufficient attention to the mechanics of such collaboration, and how it will be negotiated. Statements usually refer to the most appropriate general division of tasks between the two sectors. Little time is spent discussing the alliance building that must precede formal agreements, or how decisionmaking will be shared, or how the political competition over controlling that process will be managed, and so on.

Moreover, the statements are frequently based on optimistic evaluations of the nature and potentials of NGOs, and lack a strong empirical base of assessed NGO actions. Indeed, a recent paper from the Bank acknowledges that in practice NGOs have not performed as well in Bank financed projects as had been expected, implying that the Bank had set out with idealized visions of what NGOs could do, and would become (Beckmann 1991). Clearly then it is necessary to look more closely at NGOs' characteristics, at how they have performed to date, and at the relationships that they have already had with GOs in order to develop a stronger empirical basis on which to build interinstitutional strategies of agricultural development.

A further observation is that many commentators emphasize that the public sector will continue to play important roles in agricultural development, but that in order to achieve this it is paramount that the efficiency of the state be improved, eliminating the plethora of administrative and transactional costs that have so often undermined rural development programs (Grindle 1986; World Bank 1991a). The policy analysis, administrative capacity, and targeting capabilities implied, all suggest that any strategy devolving more activities to NGOs must still pay central attention to
improving "the management of the public sector, a goal that often requires a simultaneous reduction in the size of government and a strengthening of its quality" (World Bank 1991a, p. 136). Unfortunately, experience suggests that reforms of public sector management under SALs have not been very successful (Nunberg 1988).

A final observation reflects the first: the calls for collaboration come from different points across the ideological spectrum. They come from, on the one hand, NGO activists (for example, Clark and Jordan) and radical economists (de Janvry), and, on the other, from multilateral institutions. This may of course be cause for celebration; but it is also cause for circumspection. It suggests that different actors may be seeking differing products from such collaboration.

This indeed appears to be the case. Although it is very difficult to characterize writings, one senses a difference in emphasis between the two wings as they speak of (a) the role of the public sector in these proposed collaborations, and (b) the role of NGOs. There is general agreement that there is a need for a smaller but strong state, one that must intervene less directly in production and marketing, and reduce the amount of subsidies it channels to different interest groups: the issue, however, is how much responsibility this state will continue to assume, and which subsidies to which social groups will survive.

While such authors as de Janvry echo the far longer standing message of organizations such as OXFAM, the Inter-American Foundation, and southern NGOs, that the time of top-down, state-dominated forms of intervention in rural areas is over, this does not imply an argument for the end of, or even diminished, public sector financial responsibility in rural development. The state, it is argued, should still channel significant resources to rural areas and be active in their development, but in a more democratic and participatory way. However, governments and multilateral donors appear keener on simply reducing the role and expenditure of the state (Nunberg 1988, p. 9; World Bank 1991b). In crude terms, NGO and radical writers stress changing the role of the state in order to further the process of democratization, whereas among neoliberal economists and institutions the overarching goals of privatization and structural adjustment shine through.

This difference then translates into different emphases in attitudes toward the role of NGOs. Within the logic of privatization, the attraction of NGOs is that (a) they can subsidize structural adjustment policies by implementing the "social effects of SALs" programs; and (b) they can take responsibility for implementing other programs thus avoiding the expansion of public sector agencies. In short that they are attractive as a resource to be used. This is the instrumentalist attitude to NGOs. It is striking how often the words "use," "utilize," and "useful" crop up in many discussions of NGOs. It is also telling that although World Bank and Inter-American Development Bank (IDB) writings speak of several functions for NGOs (advice, design, implementation, monitoring and evaluation, and cofinancing) in Bank financed projects fully 57 percent of NGO participations in these projects have been in implementation, compared with 9 percent in advice, and 19 percent in design (Beckmann 1991).

Yet for the better NGOs, it is precisely the design, control, and monitoring of projects in which they wish to have a role. Reflecting this concern, other authors visualize NGOs' and grassroot organizations' participation in agricultural development in terms of increasing the space and resources to local groups to develop their potential for self-realization and self-managed agricultural development. This sits uneasily with the instrumentalist undertones of many public sector proposals.

At issue, then, is not just the pooling of skills and resources, but also the sharing of power. The comments of Fox and Gordillo (1988), and the research reported in the remainder of this paper suggests that, for GOs, the former has been more attractive than the latter, and this has caused tensions in efforts to bring the two sectors closer together.

This opening caveat suggests that as we discuss collaboration, we must tread slowly, and be aware that these GO-NGO relationships are as much about political negotiations as functional
relationships. Furthermore, we must question whether the rapid interest in NGOs under adjustment pressures has led to a mis-specification of some of the issues at stake. If all that we are dealing with is the passing on of public functions to NGOs then, as Carroll (1992) argues, this is not development, and should not be indulged. If, conversely, we are dealing with a genuine democratization of development (Clark 1991), then GO-NGO collaborations will never be straightforward - but should be indulged. This is not least because NGOs have many shortcomings and weaknesses as regards their own contributions to democratization and development. One means of addressing these shortcomings might be through a closer relationship with the public sector.

The remainder of this paper is built on two complementary themes. First we consider the nature of NGOs' needs, how well government meets them, and how it might address them more effectively in the future. Second we consider NGOs' particular strengths, and how government might respond in order to take full advantage of these strengths in national programs.

What are NGOs Anyway?

Before discussing what NGOs might need, we must first discuss what they are. Among overused and abused terms, "NGO" ranks highly. A first distinction that must be made is between northern NGOs (such as OXFAM) and those of developing countries; in this paper we are dealing almost entirely with the latter. Authors such as Fowler (1991) and Carroll (1992) also have stressed that at the very least membership and nonmembership organizations must be separated, as they differ in many respects: their social and ethnic composition, their relations to grassroots groups, their social origins, their management styles and skills and so forth.

Carroll, Humphreys, and Scurrah (1991) and Carroll (1992) also stress the importance of differentiating base groups, or Grassroots Organizations (GROs), and those membership and nonmembership organizations that administer support to the bases. The former he calls membership support organizations (MSOs) and the latter grassroots support organizations (GSOs). It is the latter with which we deal here, as we speak of NGOs. These are the NGOs composed of professionals, frequently middle class, socially and ethnically distinct from the rural poor with whom they work. In some cases these professionals are themselves former public sector workers who left the state out of political necessity (as in the case of Chile after 1973: see Gomez and Echenique 1988), because the state ceased to pursue the left of center and populist orientations they believed in (as in the case of Peru after 1975: see Carroll, Humphreys, and Scurrah 1991) or because public wages no longer satisfied their needs (during the 1980s in many countries). Because of this middle class, professional origin, government and donor staff find it socially and culturally easier to work with NGOs than with peasant staffed MSOs, and at times there are family and informal linkages cutting across the GO-NGO divide, even when there are differences of political opinion.

Characteristics of NGOs

These NGOs differ from government organizations in certain fundamental respects.

Ethos. Public sector systems are concerned with service delivery within the boundaries of institutional mandates. NGOs' concerns, while spatially bounded, are less narrowly confined by such
mandates. Instead they focus on popular participation, through which the poor themselves should define the needs to which NGOs will subsequently respond. This philosophy of work allows NGOs to develop closer relationships with the rural poor, facilitating problem identification and feedback on local needs.

Structure and Size. NGOs tend to be small, avoid complex hierarchies and prize flexibility in decision taking, although there are tradeoffs between speed of decision and adherence to democratic decision-making procedures and complex decision criteria. Small size also means inability to internalize certain economies of scale in the research process.

Financial Organization and Accountability. While GO dependence on public funds facilitates longer-term research, and implies accountability to government, NGO dependence on donated funds contributes to short time horizons, and a keenness to demonstrate rapid impact of donations. Some NGOs manage to create room for maneuver, by creating their own funding basis, but in general NGOs' financial arrangements discourage, or preclude, commitment to long-term research and development.

These differences between NGOs and GOs recur repeatedly in the following discussion of NGOs' weaknesses and strengths, and we return to the theme at the close of the paper, as we discuss future institutional implications for GO-NGO relationships.

What Do NGOs Need from the Public Sector, and How Well Has the Public Sector Obliged?

We consider a series of seven different needs that we feel NGOs have, some of which NGOs often acknowledge, others they acknowledge grudgingly at best.

Access to quality resources and information usually controlled by the public sector. In a recent meeting, Asian NGOs expressed their need for access to the skills, facilities, genetic material, and specialist knowledge of government services: an access generally hindered by the complexity of government bureaucratic structure and procedure. Large NGOs acting in consortium have occasionally persuaded Indian bureaucracy to cater to their needs (Sethna and Shah 1991), but the time and costs implied even to garner information on government plans, let alone influence them, are beyond the resources of smaller NGOs. The Philippine practice of creating NGO desks at different levels of line departments in order to elicit NGOs' views on draft plans and to cater to NGOs' enquiries, was looked on enviously by NGOs of other countries. At recent meetings of South American NGOs, the participants identified similar requirements for the improvement of their work in the generation and transfer of agricultural technology: (a) special programs of peasant-centred agricultural research to generate technologies the NGOs do not have the capacity to develop; (b) public policies adapted to the needs of small producers; and (c) links to government to widen the impact of NGOs on national agricultural programs. A frequently reported constraint was a lack of GO staff suitably prepared to work in peasant agricultural development (IICA, 1987, p. 13). As the workshop report comments, it is worth emphasizing "that lack of financial resources for projects was rarely mentioned" as a problem, suggesting that money is one thing they do not need so much from GOs (IICA, 1987, p. 13-14) although this may have changed in the last few years.

High quality public programs oriented to the needs of the rural poor. Interestingly, these needs dovetail with the roles now being cast as the most appropriate for the structurally adjusted state.
These include the following: (a) the definition of policies that are coordinated with and favorable for rural development programs (de Janvry and others 1989, p. 135; (b) the provision of public goods and services such as infrastructure and technology (de Janvry and others 1989, p. 135; World Bank 1991b, p. 131); and (c) the creation and development of human capital resources (de Janvry and others 1989, p. 136; World Bank 1991b, p. 131).

As noted above this requires the state to have high quality staff and function efficiently, and be well oriented to resource poor farmer needs in policy, technology generation, and training programs. While global generalizations on how well this has been achieved are impossible we can make a few points.

The policymaking challenge to the state requires quality economists (de Janvry and others, 1989, p. 141). The technology generation challenge similarly requires quality scientists. Given that private sector demand for such people means that they do not come cheap, the public sector must pay them well. If NGOs argue that they need these supports from an efficient state, then they ought to reassess their instinctive tendency to criticize wage hikes in current public sector reforms (for example, current reforms in the Bolivian Institute for Agricultural Technology).

The orientation of GO research to small farmer needs has been a goal of numerous farming systems research (FSR) and on-farm research projects over the last decade and a half. The ISNAR evaluations of these attempts show that some advance has been made, but not much (Merrill-Sands and Kaimowitz 1991). Similarly a series of papers at a recent FAO meeting on the institutionalization of FSR perspectives (FAO 1991) showed that institutionalizing training programs with an FSR and peasant-oriented perspective has been extremely difficult. As the on-farm research program in Ecuador currently faces the challenge of expansion, one of its main constraints is the lack of personnel with appropriate training (Cardoso, Caso, and Vivar 1991).

According to overviews of rural development programs (Grindle 1986), perhaps one of the areas in which public sectors have performed most successfully has been to install infrastructure in rural areas. There is much, however, that remains to be done in installing infrastructure for small farmer irrigation, rural agroindustry, product transformation, feeder roads, and so on. While NGOs and grassroots groups could and maybe should play roles in cost sharing for continuing these works (Silva 1991), it is very important that such works also continue to receive public assistance, despite SAPs. The extent (financial and spatial) of the work involved in many such schemes exceeds NGO capacity. The special contribution of NGOs' and MSOs' involvement may be to facilitate ex ante farmer feedback and subsequent monitoring.9

**NGO coordinating mechanisms.** A further set of requirements is acknowledged by NGOs with less frequency, but needs critical attention - and government could play a role in this. These needs stem from structural characteristics of the NGO sector. While NGOs' small size and autonomy may lead to greater flexibility, local knowledge, adaptability, and responsiveness it also leads to poor coordination, competition, duplication (of effort and of failures) and a consequent inefficient use of resources, worse in some areas than others (see Kohl 1991 for an extreme example). Also small-scale and localism means that the organizations fail to address regional and structural problems and are often unable to influence the policymaking processes that primarily determine the viability and outcome of local actions (Bebbington, 1991a). These failings imply that NGOs need a state structure to help coordinate actions to avoid proliferation and duplication; to marshal local initiatives to address regional issues; and to scale up local innovations and facilitate information dissemination (Bebbington 1991b; Morgan 1990).

**Access to policymaking processes.** NGOs also need a relationship to the state structure if they are to be able to influence policymaking (a goal implicit in the logic of their actions and rhetoric). This implies that NGOs will benefit if the public sector takes initiatives to learn from NGOs, to find mechanisms for evaluating NGO experiences in terms of their wider applicability, and
to install information collection and dissemination systems. Above all the state must find means to strengthen its capacity to coordinate among local actions, and develop policymaking processes that improve the coordination of local, regional, and national programs. Most importantly, if these initiatives are to improve NGO-GO collaboration and relations, they must incorporate means of involving NGOs (and MSOs) in the process as decisionmakers with voting power and influence. In the World Bank's terms, they must involve NGOs in the advising and design stages of policies and programs. It is only very recently that public sector agencies have begun to allow this sort of influence, and the progress is still slow.

However, to participate more effectively in these fora, NGOs must sharpen considerably their analytical and evaluative skills (Beckmann 1991). This implies the need for further training in, for example, economics, administration, and planning courses that might be provided through public or private institutions. Given the cool relationship between the two sectors, until recently, GOs have done relatively little in this regard, although GO sponsored workshops and conferences have been used by NGOs and are a useful, first stage means of establishing contacts and exchanging expertise. Much could still be done in developing courses from which both public and NGO technicians could benefit.

Similarly, NGOs if they are to realize the full potential of their contributions to policy must at least rethink, and often jettison, some of their own ideas and theories. NGOs, like development analysts, need new theories. Their concepts of state intervention are outdated, and simply not viable in the context of the state's fiscal crisis. Much of this rethinking must be done from within, but the public sector can help by providing more information on policymaking constraints and macroeconomic conditions. This is the policy dialogue so often talked about (World Bank 1991a, b, c; Beckmann 1991). One of its most important contributions to GO-NGO collaboration could be to increase each sector's appreciation of the operating conditions of the other, and their theories of development.

Up-dated theories of the state. This challenge to rethink touches a deeper issue. NGOs' theory of what the state was and should be has been bound up in their identity. NGOs have largely understood themselves in relation to the pubic sector: they existed to change, reorient and democratize a state that had resources, but gave all too few of them to the rural poor. Now that the state has fewer resources, and is reducing its direct role in such subsidiary actions (Silva 1991), NGOs must rethink their concept of the state's role in society, their relationship to it, and hence their identity. This is an extremely difficult process (Aguirre and Namdar 1991; Sotomayor 1991) and threatens the coherence and self-justification of these NGOs. Many fear becoming no different from rural consultancies. This may indeed be one viable option, but if NGOs are pushed too quickly toward it by donor and government overtures characterized by "superficiality or clumsiness, and insensitive World Bank attention" (Beckmann 1991). The threat to their identity may inspire dogmatic resistance, or quite simply the folding of the organization.

A more democratic relationship with the grassroots. A final requirement of NGOs that they rarely acknowledge is that while they may well be agents of increased democratization (Lehmann 1990; Fox 1990), their own relationship with the rural poor requires further democratization. A recurrent criticism from organizations of the rural poor (Bebbington and others 1991), development consultants (Tendler 1982), and Beckmann (1991) is that NGOs' rhetoric on participation far exceeds the reality of their agricultural and rural development activities. Similarly, NGOs are self-appointed, not elected, bodies, and control institutional resources from within. They rarely apply to themselves the principles they apply in their criticisms of the state, that the rural poor should have a voting say in the use of public resources.

For the state to try and involve itself directly in these problems would be the quickest way to frustrate NGO-GO relations, as the last few years in Kenya have demonstrated (Fowler 1991).
Similarly, when the Bolivian Government in 1989-90 proposed a register of NGOs, in part to bring them under government monitoring on the grounds that NGOs should not be concerned if an elected government wants to know, learn from, and coordinate the actions of unaccountable NGOs, the arguments that emerged set back progress in GO-NGO collaboration. In particular they did not help the proposals being tabled for a far closer collaboration between Instituto Boliviano de Tecnologia Agropecuaria—the Bolivian Institute for Agricultural Technology (IBTA) and rural NGOs in a coordinated research and extension program.

However, these NGO limitations suggest certain implications for the public sector: primarily that it should not see NGOs as representatives of, and voices for, the rural poor. Instead they should be seen as just one of several rurally sensitive voices, and in policy and programming discussions government should also invite organizations of the rural poor directly to the negotiating and planning table. This would, in turn, place more pressure on NGOs to be more accountable to rural populations. A second, longer-term, contribution government could make to these problems is to sustain educational programs in rural areas. More than anything else, it is the institutionally and politically modernization effect of broad-based education that contributes to increasing assertiveness and modern forms of self-organization among the rural poor (Thiesenhusen 1989). Those are the changes that ultimately will obliged institutions in rural areas, be they NGOs or GOs, to be more accountable to local populations.

More time, more flexibility. The reasons why NGOs have achieved less popular participation than hoped for are not, however, mainly Machiavellian. The main problem appears to be time and urgency. NGOs are primarily involved in service delivery because of the immediacy and enormity of problems they encounter in the countryside (Carroll 1992). Popular promotion and participatory actions take time, and are often pushed to one side because of other pressing concerns. Moreover, NGOs’ beneficiaries are frequently impatient if all they receive from NGOs (and MSOs) are meetings and consciousness raising sessions: most would prefer seeds, fertilizers, latrines, and irrigation ditches—and now.

This tension faced by NGOs between empowerment and the exigencies of service delivery is significant because it makes explicit an apparent tradeoff that must be considered more carefully in discussions of NGO-government collaboration. Although donors and GOs say that "the importance of NGOs lies in their ability to involve communities and grassroots organizations more effectively in the development process and in addressing poverty" (World Bank 1991a, p. 136), the bulk of the initiatives taken to involve NGOs have been in implementation - that is to say the dominant approach to NGOs is clearly an instrumental one. There is then a mismatch between what donors and GOs say and what they do; this is particularly significant because NGO experience suggests that a focus on implementation crowds out organizing and empowering actions.

This mismatch leads to one of two conclusions. The first, less generous, conclusion is that in fact governments and their donors do not want NGOs to continue organizing and empowering the poor and are seeking to frustrate such work by (a) increasing NGOs’ service delivery work, and reducing the time available to them for organizational strengthening; and (b) drawing the NGO into a closer relationship with donors and government, through which the NGOs have to become more accountable to them, with the consequence that their relationship to the poor becomes compromised and weakened. The risk of this occurring concerns many NGOs. Indeed there is evidence that some public sectors are seeking to weaken NGOs’ relationship to the poor through contracting implementation activities to the NGO.

The second, more generous, conclusion is that donor agencies and GOs want it both ways—grassroots organization and implementation. We believe that this may not always, or often, be possible. This implies that those NGOs committed to rural empowerment will not want to be
inundated with responsibilities for the implementation of projects in any collaboration they may have with government, though different NGOs may commit themselves to one or the other.

**What Could Governments Gain from Collaboration?**

If there is a tradeoff between what NGOs can contribute to increasing grassroots participation in public programs, and their contribution to enhancing the implementation of these programs, then donors and governments must consider much more carefully what in fact it is that they want from NGOs. Much hard thinking remains to be done here. This thinking should not be based on an assessment of whether NGOs meet the demands of their rhetoric, but rather on an assessment of what it is they do better than other, public or private-for-profit institutions. Then the issue is to see how this contribution can be enhanced and harnessed without being reined in.

**What Do NGOs Do Better?**

Public sector agricultural research is conventionally analyzed by stage, that is, from basic research through strategic, applied, and adaptive, with some consideration of research-extension linkages. Application of this approach to NGOs would not be particularly illuminating, because (a) practically all NGO research is problem-oriented or issue-oriented; (b) research is conducted at the levels appropriate to the issue; (c) NGOs do not feel obliged to adhere to one or other stages, they may work in, or draw on several simultaneously; and (d) NGOs often are concerned at least as much with action as with research, and many work simultaneously along the spectrum of research, testing, dissemination, and implementation (but to varying degrees at different points).

In the following five main areas NGOs have been both innovative and constrained in what they have achieved: (a) diagnostic and farming systems research methods; (b) innovations in technologies and resource management practices; (c) dissemination methods; (d) training activities and methods; and (e) promoting farmer organizations for agricultural development.

At this point, however, it is important to make a cautionary note about generalizations. The following should not be read as a manifesto for NGOs. There are many things NGOs do not do well, some of which have and will be considered. Moreover, different NGOs have different strengths. Some are better innovators; some are better popular mobilizers; some are better implementers. In the future this should lead into a more explicit differentiation within the NGO community on the basis of specialties. A parallel question to which we return later is, therefore, how can the public sector develop an approach to NGOs that will allow and facilitate this differentiation?

**Diagnostic and farming systems research methods.** NGOs' natural resources programs commonly focus on the rural poor, including women and the landless. They also tend to work predominantly in what have been referred to as complex, diverse, and risk-prone areas (Chambers, Pacey, and Thrupp 1989). Conventional reductionist approaches to research have difficulty in coping with the wide range of agroecological and socioeconomic conditions characteristic of these areas. Much research must not merely be on-farm and farmer-managed, but highly participatory in order to meet farmers' needs, opportunities, constraints, and aspirations and to draw on local knowledge which, in many cases, has evolved over generations. However, many participatory approaches have
been expensive in terms of the amount of change-agent time that has to be spent for each beneficiary, and NGOs have been innovative in developing more parsimonious approaches, and then training other NGOs in the use of these methods.

For instance, in Ecuador, the NGO Comunidec has used popular education techniques to elaborate techniques for participatory appraisal, design and ranking for agroforestry projects. In Kenya, the Diagnosis and Design methodology practised and diffused by ICRAF finds its origins in development by CARE and Mazingira in the early 1980s of methods to elicit rapid farmer assessment of tree species and of the opportunities for introducing new species (Buck forthcoming). In Chile, NGOs (especially the Grupo de Investigaciones Agrarias, GIA, and AGRARIA) were responsible for the elaboration of farming systems perspectives, and their subsequent teaching to other institutions (Sotomayer 1991; Aguirre and Namdar 1991). In India, Myrada has been instrumental in developing participatory rapid appraisal methods and training both other NGOs and government staff in their implementation (Fernandez 1991).

NGOs have introduced systems approaches to research which go beyond conventional FSR. For instance, in Chile, AGRARIA is experimenting with means of commercializing small farmer grain, in the absence of state initiatives in this area. Its early innovation has been so successful that the National Institute for Agricultural Development (INDAP) has since contracted it to study the possibility of expanding the innovation to other areas (Aguirre and Namdar 1991). In Bangladesh, the Mennonite Central Committee conducted the varietal research on which around 1,000 hectares of soybean production by farmers is now based. Realizing that the potential uses of this crop were unfamiliar to small farmers, they introduced training programs in marketing and processing, which helped to stimulate commercial demand for the product (Buckland and Graham 1990). In The Gambia, production of sesame introduced by Catholic Relief Services peaked at 8,000 hectares owing in part to their simultaneous introduction of oil extraction technology (Gilbert 1990).

Nonetheless, there are also constraints on how far NGOs can operationalize an FSR approach. The time and resources required for thorough systems analysis are often beyond the capacity of NGOs. There is also frequently a tension between the action concerns of the NGO and the time required for full identification and delineation of a farming system (Farrington and Bebbington 1991). NGOs have also been instrumental in introducing a social organizational dimension into the testing and subsequent adoption of certain technologies. Lack of this dimension, which government finds difficult to introduce, has often led to previous failure of the techniques. For instance, in India, Action for World Solidarity and a consortium of GROs in Andhra Pradesh devised a strategy for integrated pest management of caterpillar (Amsacta) on castor together with government research institutes, and then helped to organize farmers to take certain action simultaneously in order to achieve maximum impact (Satish, Vardhan, and Farrington 1990). In The Gambia and Ethiopia, NGOs have helped farmers to organize local informal seed production in ways designed to avoid undesirable cross-pollination (Henderson and Singh 1990). In Bangladesh, NGOs have helped to organize landless laborers to acquire and operate ‘lumpy’ irrigation technology (Mustafa and others 1991), and have organized groups (mainly of women) to interact both among themselves and with government services (providing day-old chicks and vaccines) in chicken rearing (Khan and others 1991).

Innovations in technologies and management practices. Although it is comparatively rare to find NGOs conducting long-term research for the generation of technologies, several have done research which has had far-reaching implications. For instance, in India, the Bharatiya Agro-Industries Foundation pioneered research into frozen semen technology and through its 500 field programs in six states has been responsible for producing around 10 percent of the country’s cross-bred dairy herd.
Similarly, the South Mindanao Baptist Rural Life Centre (Philippines) has conducted highly innovative research to identify integrated methods of managing hillslopes (Sloping Agricultural Land Technology) (Watson 1991). The agroecology movement in Latin America, now strong enough to have a continental network (the Latin American Consortium on Agroecology and Development, CLADES) that negotiates with international and national agencies has been built mainly through the efforts of NGOs in contact with North American universities (Altieri and Yurjevic 1991; Altieri 1990). Many of these NGOs sought to develop low input technologies in response to the resource constrained environments of the rural (and urban) poor.

It should be noted, though, that not all these NGO technology generation initiatives have been successful, as the very variable success with protected crops technologies in the Bolivian highlands shows (Kohl 1991).

Most NGO research efforts are, however, at the adaptive end of the spectrum. For instance, in India, PRADAN has scaled down technologies developed by government institutes for mushroom and raw silk production, and for leather processing and, in the case of the latter, has devised integrated schemes of credit and marketing (Vasimalai 1991). Under the Farmer Innovation and Technology Testing program in The Gambia, eight NGOs collaborated with the Department of Agricultural Research in 1989 to test a number of new crop varieties on-farm and provide feedback (Gilbert 1990). In East Africa, NGOs have been testing new crop varieties in Zambia (Copestake 1990) and in Zimbabwe (according to MacGarry in Ndiweni and others 1991), and have been developing tree management practices in Zimbabwe (according to Gumbo in Ndiweni and others 1991) and Kenya (according to Arum in Mung’ala and Arum 1991).

Dissemination methods. Diffusion and dissemination of the technologies with which they work is ultimately limited by NGOs’ small size and limited spatial coverage, although some studies demonstrate significant impacts of NGO disseminated technologies among small producers (Aguirre and Namdar 1991). Perhaps more important than this direct impact have been institutional and methodological innovations developed by NGOs, which facilitate the dissemination of technologies, particularly innovations facilitating the delivery of small amounts of credit to peasant producers. An obvious example is the Grameen Bank, but another would be the joint fund developed by La Central Ecuatoriana de Servicios Agricolas - the Ecuadorian Center for Agricultural Services (CESA) in conjunction with the National Agrarian Bank in Ecuador (Jordan and others 1989, p. 281).

NGOs have sought to develop dissemination methods consistent with their wider participatory and empowering approaches. For instance, in Thailand, the Appropriate Technology Association developed farmer-to-farmer methods of disseminating rice-fish farming technologies, which have subsequently been adapted by the department of agriculture. In Ecuador, CESA has developed systems for farmer-managed seed multiplication and distribution (CESA 1991; Mastrocola, Andrade, and Camacho 1991). A number of NGOs in eastern Bolivia use local radio services to disseminate information on agricultural technologies.

NGOs have been much quicker than GOs to develop networks as a tool for the information exchange. Examples include the East India Farming Systems Research Network operated by Ramakrishna Mission (Chakraborty and others 1991) and the national network of development organizations working on environment, energy, and community development, which comprise the Kenya Energy and Environment Organizations (KENGO) (according to Arum in Mung’ala and Arum 1991).

Training activities and methods. As mentioned above, a number of NGOs train both members of other NGOs and of government organizations in participatory methods, for instance, Myrada (Fernandez 1991) and Ramakrishna Mission (Chakraborty and others 1991) in India, and GIA and AGRARIA in Chile (Berdegue 1990).
A particularly innovative approach was developed by the Aga Khan Rural Support Programme (AKRSP) in Gujarat, India, over a period of years (Shah and Mane, 1991). Their contact with farmer groups in a number of villages led to the identification of training needs on several topics. Initial attempts to have government services conduct the training proved unsuccessful. Despite AKRSP’s attempts to have trainers make prior visits to villages in order to adapt their material to local situations, the courses themselves were held in a classroom setting, with trainers lecturing to farmers. Farmers’ evaluations showed that they had learned little of practical value from the courses. AKRSP responded by developing a participatory training and extension methodology with local farmers, which it tried out successfully in several areas before bringing government staff in to observe, participate in, and finally adopt the methodology. Successful adoption was reinforced by informal networks, and exchange of experience at workshops and consultations.

A further innovation, this time the preparation of materials for training and dissemination, is reported by Gonsalves and Michlat-Teves (1991) for the International Institute for Rural Reconstruction in the Philippines. This NGO was given the funds by an international foundation to assemble resource persons from NGOs and GOs at a one-week workshop, the objective of which was to produce a completed Agroforestry Resource Kit. The manual was produced according to plan, and is now used widely.

**Promoting farmer organizations for agricultural development.** For many NGOs, if not most, the ultimate stated goal of their work is to enhance the rural poor’s capacities for self-management and for negotiating with the state. In this regard many NGOs operate with a concept of participation that goes beyond the ways in which the word is generally expressed in farming systems and participatory research literature. For these NGOs to enhance participation means a commitment to work in popular education and in strengthening peasant organizations (Farrington and Bebbington 1991).

Consequently, NGOs have emphasized project methodologies and actions that contribute to strengthening the coordination between individual producers, and subsequently between communities. In such a context, seed and input distribution systems, irrigation development and management, and work with groups of farmers to design, conduct, and evaluate on-farm trials have become priority areas of action. By creating spaces where joint action is necessary the hope is to foster the formalization of an organization. In many cases such a combination of productive and organizational initiatives can increase the impact of the project and strengthen the organization simultaneously. The ultimate aim is to establish a financially and administratively self-sustaining organization (CESA 1980, 1991).

Notwithstanding these goals, and the rhetoric that surrounds them, there have been limitations to NGOs’ contributions to the formation of farmer organizations. However, it remains the case that the bulk of the experience in linking agricultural development projects with organizational strengthening has been gained in the NGO sector and for that reason NGOs have much to teach GOs in this area.

**NGO Performance and Institutional Characteristics**

The overall picture is of a vibrant NGO sector whose principal strengths are a capacity for innovation, adaptation, responsiveness, and in certain measure popular participation, and whose principal weakness arises at the point of implementing and scaling up the impact of these innovations.
To give a full explanation of the reasons for these performance characteristics is beyond the scope of this paper, but it is important to draw attention to several considerations. At the heart of any explanation of this performance is the institutional structure of NGOs, individually and as a sector, for it is this structure, and the historical circumstances that gave rise to it, that are a source both of NGOs' strengths and of their weaknesses.

The creation of NGOs has been a response to tendencies in the state, economy, and society. As noted, many were formed in political opposition to governments that pursued policies toward the rural poor with which the NGOs' founders disagreed. Others were formed in response to ruling party patronage, or frequently authoritarianism, that forced nonparty members and/or left-leaning professionals out of public sector and university positions. Others were formed as a result of the crisis of developing country universities, particularly social science departments, starved of resources by government for either political (for example, Chile) or economic reasons. For all these groups, forming an NGO was in part a survival strategy, and in part a means to continue pursuing the sort of work these professionals wished to do.

The result was the formation of organizations that had to be small because such NGOs would live off relatively small grants from the North, and at times because smallness was a means of "keeping one's head low" in politically difficult circumstances. The political context meant NGOs were critical of government, which led them to avoid any contact with it. The structural context of their origins meant that the intellectual and professional calibre of NGO staff was generally high.

The result was small groups of motivated, qualified, and relatively well-paid professionals, often with close links to supportive northern universities offering postgraduate training, a recipe for creativity and innovation. The sociopolitical origins also have much to do with the frequently noted work mystique among NGO staff (Carroll 1992). Their smallness, and the related institutional flexibility, similarly contribute to this mystique, and to the NGOs' 'shallow' hierarchies, and their short lines of communication. Smallness and flexibility also facilitate effective collaboration among disciplines, a capacity for rapid decision taking, a quick response to eventualities and a work ethic (and corresponding reward systems) geared to generating sustainable processes and impacts.

But the smallness and the political origins and orientation of the NGOs are also their "Achilles' heel." The concern to keep a distance from public sector machinations, and the lingering distrust of the state are a clear consequence of these origins. The smallness also means that (a) NGO projects rarely address regional and structural factors that underlie rural poverty; (b) the research capacities of NGOs are resource constrained; (c) the dissemination capability of the NGO is highly circumscribed; and (d) the activities of different NGOs remain uncoordinated, and information exchange is poor. The distance they keep from the state structure means they are also distant from the main means of increasing such coordination and communication, of widening the impact of good innovations, and of gaining access to research that might address the technology generation constraints noted earlier.

Finally, the nonpublic nature of these NGOs leads to financial arrangements that are also a source of some of the weaknesses noted. Dependence on short cycle project funding is an obstacle to long-term perspectives and long-term research commitments (for instance in sustainable resource management research). Similarly the knowledge that other NGOs are seeking the same funds from a finite stock fosters an unhealthy competition that can make them unwilling to share information, and focus on rapid visible impacts in order to impress donors, so that they renew the grant (Kohl 1991). This can lead, for example, to the dissemination of technologies still insufficiently screened (Kohl 1991).
Institutional Implications for Public Sector Strategies under the Pressure of Structural Adjustment

The NGO experience has, then, been characterized by a wealth of creativity and action. Taken together, these leave as their heritage a corpus of accumulated knowledge and experience in the problems of agricultural development in complex, high-risk, rural environments among the poorer segments of the rural population.

At the same time there have been many failures, in part reflecting inherent limitations on the NGO model of rural development. Central to these limitations is the poor (or nonexistent), coordination of a large number of small, local activities conducted by a population of NGOs that has a real potential for continued proliferation.

In times of structural adjustment programs, as public sector resources for agricultural development become scarcer, the resulting challenges to government are (a) to support and enhance this NGO capacity for creativity; (b) to help address the conditions that obstruct the NGOs' contribution to sustainable and democratic forms of agricultural development; (c) to identify areas of action in which direct collaboration between GOs and NGOs may be viable; and (d) to incorporate the results and lessons from the NGO experience into wider programs of agricultural and rural development. Responding to these challenges will require a sensitive, measured response on the state's part, and will demand the characteristics of a strong state that several of the authors noted at the beginning of the paper called for.

Supporting and enhancing NGO creativity: resisting the temptation of instrumentalism. Taken as a population, NGOs have contact with a large number of rural producers, above all with poorer strata than those with whom the state has typically worked. In 1988, NGOs in Chile had as many staff as INDAP (Berdegue 1990). In 1990 in Bolivia, FAO counted 385 NGOs, 154 in the countryside (FAO 1990), and other informed estimates suspected the total was nearer 600 to 700. As such, there is a strong temptation to see the NGO sector as a potential disseminator on a mass scale. This temptation should be resisted. If indulged uncritically, it may easily aggravate NGO-government relationships. In almost all our contacts with NGOs we have detected a strong criticism of governments and multilateral donors for seeing them as a resource to be used as a subsidy to the implementation of public programs. In Bolivia, when the idea was floated that the Bolivian Institute of Agricultural Technology would leave extension in the altiplano to NGOs, their reaction was lukewarm to say the least. Many NGOs reject such an instrumentalist attitude on the grounds that (a) they are very uncertain about participating in the privatization of the service provision that they argue should be the state's responsibility; and (b) if they are to play such a role, they must play a role in program design and decisionmaking as well: if responsibilities are to be shared, then so too must power.

This implies that any such devolution of implementation to NGOs must be carefully and openly discussed with them from the start, rather than presented as a fait accompli. The bad feeling generated in the Bolivian case was one of the factors that contributed to a very slow start in the planned restructuring of IBTA. It is now apparently being resolved by some skillful mediation by more sensitive individuals.

Second to force NGOs into an implementational role can easily damage the NGO and its capacity to innovate. Comparing the experiences of two Chilean NGOs, GIA and AGRARIA, with INDAP's extension program is illustrative here. Since 1990, INDAP has allowed NGOs to bid for contracts to implement agricultural extension, expanding a mode of contracting in which only commercial extension companies had been allowed to bid under the Pinochet regime. AGRARIA
committed itself wholesale to the program, more than doubling its staff with the new INDAP contracts it won. However, the number and inflexibility of the contractual requirements prevents those parts of AGRARIA working with INDAP from pursuing the social promotional work that has characterized the NGOs' work in the past. This has introduced tensions within the organization between those working under the rigors of INDAP contracts, and those on the softer projects of donor agency money that allow more time to be spent experimenting and in fostering farmer organization. It also has hindered AGRARIA's capacity to continue innovating in extension methods. The time spent simply administering the contract has diverted staff attention from developing their reflections on the implications of these contracts to generate and publish alternatives. While AGRARIA's strategy has been to use the income from these contracts to subsidize experimental work in postharvest stages of the food system, which shows signs of being successful, the institution is very concerned that the burdens of implementation are damaging the cohesion and identity of the organization (Aguirre and Namdar 1991).

GIA, by contrast, has decided to treat the possibility of bidding for INDAP contracts as a chance for a new form of research. By participating in the contracts, GIA can study their mechanisms, and their implications for both the farmer and the implementing agency. Consequently, GIA has bid for and won a restricted number of contracts in order to study the process of administering extension under INDAP's criteria. GIA intends to publish some of these findings, with recommendations on how to amend INDAP's strategies.

This innovative capacity of NGOs is an important resource, given that the pressure of workloads and the frictions of bureaucratic procedure mean that innovation does not come easily to the public sector. The study (Cardoso, Caso, and Vivar 1991) of the on-farm program in Ecuador's public sector demonstrates the constraints of bureaucracy. Thus the state should place a strong premium on nurturing NGOs' innovative capacity, and then on developing means to harvest the fruit of such creativity for wider implementation.

If, as we are claiming, a heavy emphasis on delivery hinders innovation, the implication is that the most innovative NGOs (like GIA) ought to be stimulated to continue innovating, while others be encouraged to work in delivery programs that incorporate such innovations. This implies a differentiated public policy, supporting research in some NGOs, but also sustaining a subcontracting implementation program. Research ought to be financially supported through programs of competitive research funding, with support going beyond the short term in order to allow analysis of longer-term resource management issues, and to take pressure off research competent NGOs to look for implementation money. Over time, different NGOs would find their niche, some as innovators, others as implementers. The implementers ought to be supported with training programs, perhaps given by other innovative NGOs, disseminating ("scaling up") their innovations. Ultimately a three-tiered NGO community might emerge: some as applied research centers; others as essentially rural development consultants (contracted to GOs and MSOs alike) akin to the "Technology Transfer Companies" of Chile, and the IFAD proposals for contracting NGOs to implement a technology transfer and rural credit system for Peru (IFAD 1991); and others as hybrids combining research and implementation with donor and national resources.

Financial Implications. This of course brings us to the issue of what, if any, government's role might be in funding NGO activity. There are several mechanisms available.

Research Grants. If it is accepted that NGOs' creativity is a national resource that should be promoted, then there is a clear role for government support for this research. The mechanism for support might be a research contract, another might be grants with fewer stipulations. The one main demand on the NGO ought be that the results of the research be available and published in the public domain. Such grants also would allow support of longer-term research activities than NGO donors generally support.
Contracts for Implementation. While there are many drawbacks to contracting implementation to NGOs, these relationships will clearly be important in the future, and some NGOs will opt for such contracts. While accountability requires that the contract have terms of reference, there is still a case to be made for incorporating an element of flexibility into the relationship, to allow the NGO to respond to local needs and problems as they arise.

Contracts for Training. If NGOs are to train public employees, these services should be paid.

Consultancy Contracts. Another promising mechanism is to channel certain consulting work to the NGO sector, with contracts given to the NGO rather than the individual so that the income generated contributes to strengthening the NGO's funding base. Given the high quality of professionals in many NGOs they are a clear source of expert knowledge. Indeed their staff have already been used in multilateral agencies preproject consultancies, apparently to good effect.

Flexible Legislation. Government's contribution to strengthening NGOs' financial standing need not be only direct. Equally important is to provide a legislative framework that makes it easier for the NGO to experiment with new ways of raising resources. Many NGOs have charitable status, but a further support to NGOs could be to make legislation for the creation of foundations more flexible. Similarly attractive might be to establish mechanisms to allow NGOs to combine project and consulting activities, charging market rates in the latter in order to contribute to central funds or project resources, but without losing their charitable status. In Chile, AGRARIA is currently considering just such a strategy. Conversely, any government attempt to begin taxing NGOs' incomes would only weaken their capacity for innovation and experimentation.

Potential areas for direct NGO-GO collaboration. Despite all the caveats about the problems of a GO approach to NGOs that seeks to "use" them, there do seem to be areas in which direct collaboration and sharing of resources, skills, and responsibilities could be mutually advantageous for NGO and GO alike. One area is in more carefully conceived contracting relations.

Another area with potential for closer collaboration is in sustaining (and enhancing) on-farm research programs. From an NGO viewpoint, a contact with such programs could be favorable for various reasons: (a) it would help address a frequent problem for NGOs, namely their poor access to GO technologies, especially seed; (b) it would be a means of gaining research and technological support, to help address some of NGOs' technology generation constraints; (c) it could offer a channel for NGO influence, via the on-farm research programs (OFRPs) on experiment station research; and (d) combining these three points could enhance the efficiency of NGOs work in technology adaptation work.

This NGO need marries well to a need of the public sector: OFRPs are expensive because of the diagnostic research they require, and the personnel and travel costs of maintaining on-farm trials. Consequently, they are often early casualties of resource cutbacks (Biggs 1989). As an example of a GO response to this constraint, the former director of Ecuador's OFRP has proposed an NGO-OFRP collaboration in which the GO provides technical assistance in the research, and facilitates NGO access to public sector generated technology, whereas NGOs provide local diagnostic knowledge, supervise on-farm trials, and conduct the bulk of the field adaptation, and on the basis of their experiences influence public sector research (Cardoso 1991).

Such collaborations could be the basis for the establishment of regional research planning committees, in which NGOs, farmers' organizations, and the GO would all have voting power. On-farm programs seem to be perhaps the most promising area in which to initiate GO-NGO collaborations.

A role for GOs in addressing constraints on NGO impact. It was noted earlier that not all NGO generated technologies are useful - there have been misguided innovations that NGOs have disseminated with negative impacts on the rural economy (Kohl 1991). These ought to be monitored. There may be a role for a national technology evaluation council to try to avoid this sort of problem.
Much as NGOs will dislike the idea, some form of quality control is required. Again this offers scope for an initiative by the state. The sensitivity of the issue, however, implies that from the outset NGOs and farmer organizations ought be represented on the council.

However, perhaps the key constraints on NGOs' impacts are their limited resources and the poor coordination and communication among them and between them and GOs. One obvious role for the public sector would be to install mechanisms for the communication of innovations (and failures) in order to avoid duplication of efforts among different institutions. Periodic meetings, fora, or information systems could all contribute to this.

Coordination is a step beyond communication, requiring greater mutual trust, and so should be preceded with sustained informal contacts between GOs and NGOs discussing the possibility of increased coordination. Consequently, this is perhaps best initiated at local and provincial levels in periodic meetings. Again, this is a task appropriate for the public sector, both because of its axial administrative role in local society, and because, being the locus of policy and programming decisions, it could take the initiative of inviting NGOs into such programming. Contacts might begin with efforts to avoid overlaps between the actions of different institutions, and later move on to the planning of regional agricultural strategies, in which NGOs would also have decisionmaking power.

Some examples demonstrate that this coordination is possible. In South Nyanza, Kenya, the District Forest Officer has been able to act as a focal point for coordination of NGO and GO environmental activities (according to Charles in Musyoka, Charles, and Kaluli 1991). This contrasts with experience in neighboring Siaya District where many of the twenty-six NGOs with agricultural and agroforestry projects have individual links to government, but the absence of agreed mechanisms of coordination means that overlaps persist. All these are ways in which government can help address the much noted problem of scaling up (Annis 1987; Morgan 1990).

Incorporating NGO lessons into wider programs. A further stage in addressing the problem of scaling up, and one that is specifically a government task, is to incorporate lessons from NGOs into those government programs that continue to be implemented through the public sector. Such incorporation would be facilitated by the information exchange fora discussed earlier, but a further step might be to consider setting up advisory councils for public programs with NGO and farmer organization representation on the councils.

There are many different degrees to which lessons and innovations from the NGO experience might be incorporated in public programs. The simplest would be to work with technologies adapted or introduced by NGOs. Less simple, but not difficult, would be to incorporate NGOs' methodological innovations in participation, organizational strengthening, extension, screening, and so on. A more profound change would be to take lessons from NGOs' institutional structure and incorporate them into GOs. This would mean decentralizing authority within GOs, increasing the flexibility and adaptiveness of local offices. It also would involve structuring local offices of GO programs along the lines of NGOs' small, relatively informal field offices, while retaining the coordinating mechanisms made possible by the presence of the overlying institutional structure of the public sector.

A yet more radical institutional response would be to accept that the still limited accountability of NGOs to local populations is equally a shortcoming of the public sector, whereas local rural councilors are increasingly elected by the rural population, the staff of ministries of agriculture and rural development projects most definitely are not. If GOs are to criticize NGOs for not allowing real farmer participation in the design and monitoring of their projects, then GOs should also move toward allowing such participation in public programs of agricultural development. This is not to argue that farmers should hire and fire GO staff, but that they should have a far more active role in designing these projects.
The likelihood, of course, is that this will happen only rarely, partly because of GO resistance, and partly because organizations of the rural poor that would elect representatives do not exist everywhere. So in the short term, it is more likely that NGOs might be involved in these programs as representatives of the concerns of the rural poor. Indeed perhaps the key way in which the public sector can enhance the impact of NGO initiatives is to allow them as representatives of the rural poor to influence public programs through their insights and experiences. Ultimately though, and sooner rather than later, it should be the poor themselves who are there, with NGOs advising as experienced specialists.

Endnotes

1. This paper draws on multiagency study, coordinated by the Overseas Development Institute since 1989, into the scope for closer NGO-government links in the generation and transfer of agricultural technologies. The case studies, from Africa, Asia, and South America, will be published in three volumes by Routledge (United Kingdom) in 1993, together with an overview volume.

2. "The Bank's NGO initiative turned out to be part of an international wave of interest in NGOs. The dramatic spread of democracy ... has led to more favorable government attitudes toward citizens' groups in many countries. More generally, the experience with ineffective public-sector programs and tight fiscal constraints has made many governments aware of their limitations and more interested in what NGOs can contribute" (Beckmann 1991).

3. All non-English quotations have been translated by the authors.

4. Carroll's (1992) assessment of the characteristics of successful NGOs is a striking and illuminating exception in this regard.

5. Asia Regional Workshop on "NGOs, Renewable Natural Resources Management and Links with the Public Sector." Held in Hyderabad, India, 16-20 September 1991.


8. This is the "scaling up" concern noted by authors like Annis (1987).

9. An example here from the current research is the involvement of an NGO (CESA) and an MSO (Tukayta) in an IFAD funded large irrigation scheme in the southern Ecuadorian Andes (CESA 1991).

10. "To take advantage of the opportunities and avoid the pitfalls requires of NGOs new disciplines of analysis, research, and observation, and a rethinking of their position on development policy issues." (Clark 1991, p. 176).
11. The Bank suggests that such dialogues have led NGOs to see the need for economic reforms they would previously have rejected out of hand (World Bank 1991c, p. 4).

12. Carroll (1992) is a wide ranging and very useful study of the characteristics of NGOs that perform strongly.

13. For instance, in several Latin America countries significant numbers of NGO staff have trained at the University of Louvain.

14. The situation in the public sector is not necessarily any better. An eye on the next election also fosters "short-termism," and pressures on public budgets mean GOs cannot be sure of the resources they will have next year.

15. However, it should be noted that some NGOs have been highly successful in long-term research endeavors. For instance, the Mennonite Central Committee has conducted several pieces of long-term research during its 17 years of experimental work in Bangladesh. The agricultural origins of many MCC volunteers obviously foster this perspective. Similarly, the development research orientation of Baharatiya Agro-Industries Foundation (BAIF) in India has permitted its substantial investment in research.

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THE AGA KHAN RURAL SUPPORT PROGRAMME EXPERIENCE

Shoaib Sultan Khan

In the backdrop of the Ethiopian crisis a few years ago, the London Economist had sounded a note of warning to the advocates of nongovernmental organizations (NGOs) taking over countrywide implementation of emergency aid and development programs and had instead urged efforts at persuading governments to act like NGOs. The Aga Khan Rural Support Programme (AKRSP) is an experiment in demonstrating how governments can launch countryside development and extension programs in an effective and equitable way.

Conceptual Package

As against the traditional approach of having an army of extension workers for delivery of services, AKRSP relies on fostering rural cadres of extension workers from within the beneficiaries to undertake the job. However, there are certain prerequisites that have to be put in place before the poor of the world can be helped. The most important requirement is fostering a framework of grassroots institutions. Institution building thus becomes the sine qua non for all future developmental and extension activities.

AKRSP began its activities more than 9 years ago, on clearly established objective concepts and operational principles. Every village the Management Group (MG) of AKRSP visited was offered a development partnership with clearly articulated obligations encompassing willingness of villagers to (a) organize and cooperatively manage their affairs; (b) generate their own capital through savings; and (c) upgrade their human skills.

The villagers were offered help and assistance in undertaking their development needs, as perceived by them, in return for fulfillment of the terms of development partnership. AKRSP shied away from those villagers who failed to fulfill their obligations and did not adhere to the terms of partnership. A number of skeptics derided this approach and quoted the experience of cooperatives in the subcontinent. Our answer to these skeptics was and is, first that there is no better approach to help smallholders to rise about the level of subsistence, and second we would only know the response of the villagers to the offer of partnership once we make such an offer to them. We were quite clear in our minds, as taught to us by our mentor and teacher in rural development, Dr. Akhter Hameed Khan, that the theoretical framework of the program should be clearly spelled out before embarking

on implementation of the program. A rural development program without a sound theoretical framework is like building a crooked wall, defying the law of gravity. We know that the capitalist and socialist models of rural development were not relevant to our situation for one reason or the other. It was the Raiffeisen model of cooperation, which held the greatest promise for the smallholders of northern areas of Pakistan, and for that matter for all subsistence agriculturists in developing countries.

Program Package

In 9 years of our work in the district of Gilgit and over 5 years in the districts of Chitral and Baltistan, the villagers responded to the terms of development partnership by organizing 1,477 village organizations (VO) embracing over 66,887 households (over half a million people), generating nearly a hundred million rupees as savings, kept in scheduled banks, and getting an army of rural cadres trained comprising 3,000 village managers, over 5,000 village level livestock, plant protection, marketing, poultry, and forestry specialists, half of whom are women. The VO also responded to the call for evolving a program package by identifying the following: (a) organization and collective management; (b) land development; (c) increased productivity; (d) credit and banking; (e) marketing; (f) reduction in workload of women; and (g) coordination with social sector.

Catalyst for Organization

A question often asked is: what brings the villagers together? Our experience has shown that, left to themselves the villagers are capable of identifying a need, fulfillment of which would bring the village or the interest group, which has taken the form of a VO, together and serve as the glue to bind them in a continuing relationship. This portfolio of needs, falls in the productive sector, as against social sector and has to be identified through a process of diagnostic survey, entailing a series of dialogues with each and every VO. There is no shortcut to this process in view of the micro variations between the villages and the fact that identification of their development needs does not lend itself to a distant planning process. This portfolio of needs, in AKRSP parlance, is called productive physical infrastructure (PPI). The PPI is the investment in organization without which it is only a pious hope that community participation would be forthcoming from the villagers, on a continuing basis, for development work. On an average, this one time subsidy or investment in a VO comes to Rs.177,000 (US$ 9,000).

Concept of Self-Help

Another feature of this subsidy is payment of wages to villagers. To many purists this amounts to blasphemy and complete negation of the concept of self-help. Our experience has been that these PPIs require thousands of mandays for completion and to expect subsistence holders to
contribute their labor free day in and day out is really asking for the moon. No wonder most of the so-called projects completed on self-help basis, have a dismal record. AKRSP, therefore, redefines self-help as villagers’ willingness to organize, to generate their own capital through savings (they agree to allocate 25 percent of the wages as savings), to upgrade their human skills, to take full responsibility for management including record-keeping, implementation, completion, and maintenance of the PPI. The wages paid are negotiated and are normally 20 to 25 percent less than the market wage, for the simple reason that work is provided at the doorstep of the villager and his labor is directed toward accretion of his own asset. The ultimate objective of the self-help is to establish a self-reliant and self-sustaining system of management at the VO level. A shortsighted policy of insisting on free labor as a component of self-help would have got us nowhere near out ultimate objective of a village management system based on a framework of institutional organization, namely VOs.

Investment in Organization

Many critics consider this subsidy to be too high, some have even accused us of bribing the villagers. Both the charges are based on misconception. The amount of subsidy is determined on the nature of PPI as surveyed and estimated by the Engineering Section of AKRSP and is not an ad hoc figure. In fact the only criterion applied to sanction a PPI, is the capacity of the VO—what it can manage, implement, complete, and maintain. The VO is forbidden from employing contractors or employing labor from outside unless VO members find it necessary to get help from outside labor. As to the question of bribes, AKRSP believes that considering the destitute condition of the rural poor, it would be impossible for the poor to rise above the level of subsistence without outside assistance. Because the critical factor, as a first step in ameliorating the condition of the rural poor, is fostering an institutional framework or an economic and social infrastructure, AKRSP uses the subsidy in achieving the twin objective of responding to the identified need of the VO and strengthening the organization. The small one time subsidy has proven a high payoff and the AKRSP experience bears testimony to this fact. None of the 1,165 VOs where PPI subsidy was given, came back for a second grant but nearly 500 VOs obtained loans by providing savings collateral to undertake productive schemes, such as, land development, acquiring agricultural machinery, nursery development, fruit processing units, and so on. A number of VOs also undertook self-financed PPIs. We feel that our trust that villagers are capable of acting responsibly once resources along with responsibility is entrusted to them has been well placed.

Village Organization (VO)

Without organization the smallholders and the poor cannot rise above the level of subsistence. Their biggest handicap is their smallholding. To overcome this handicap, they must pool their resources to get economies of scale, to cut down overheads, and to get the best prices for their produce. What form should this organization take?
Size of Village Organization

What is a village organization (VO)? Is it synonymous with a village? Can there be more VOs in a village? The short answer to these questions is that the VO is an interest group and therefore, there can be more than one VO in a village. However, to qualify to be a VO, besides common interest, there should be geographical proximity of households and willingness of over 75 percent of the population to form an organization.

The membership of the VO depends on the size of the interest group and in the program area from 8 households at one extreme to 130 at the other. The majority of the VOs comprise more than 50 households or 450 souls. The 8 households form a habitation geographically isolated and sustaining an autonomous agroeco system. It would have been unfair and unrealistic to force them to join a bigger VO adjoining them because of lack of common interest and difficulties in communication.

Some big villages have as many as six VOs but each VO is geographically and by name identifiable, for example, village Nomal in Gilgit district comprises Madinatul Karim, Sadrudinabad, Segal, Majini Mohallah, Batot, and Aminabad as VOs. In Gilgit district the number of villages is reported to be 306 in official statistics but the number of VOs is likely to be 500. This does not, however, entail a PPI subsidy to each VO. For purposes of PPI subsidy, all the beneficiaries are treated as part of one VO. Thus of the 491 VOs in Gilgit district, only 340 qualified for the subsidy.

In many cases after the completion of a PPI and thus attainment of their common objectives, VOs split to form separate organizations, in the interest of regular meetings, savings, and participation in other packages of AKRSP. As part of a bigger VO, members felt inhibited in getting full benefits of AKRSP packages other than PPI. Of course in some cases the motivation could clearly be seen as a ploy to get another subsidized PPI.

The program staff has to be vigilant to discourage such attempts. The doubts expressed in some quarters that VOs cannot be formed in other parts of Pakistan because of the larger size of villages, is not born out by facts. Over 80 percent of the villages in Pakistan have less than 2,000 population (GOP 1985) and over 90 percent less than 3,000.

Equitable and Democratic Development

A VO to be viable must meet as a general body regularly and not leave the affairs of the organization to be managed by a few members. The VO does elect a president and a manager as its office bearers, but it does not elect a committee to manage the VO. It may elect committees of members for specific activities, such as, management of a VO tractor or machinery, resolution of disputes, enforcement of decisions of the general body on free grazing, and so on. It is through the regular meetings of the general body, which may be weekly or fortnightly and in no case less than monthly, that the supremacy of the members is assured. Experience has shown that executive committees proved the bane of the cooperatives.

The role of the lay members in keeping the VO on the right track has to be continuously emphasized. The members are urged to insist that the office bearers keep the members informed of VO accounts, savings, and other matters. A VO where members fail to do so either because of sheer indolence or obstinacy of office bearers makes sluggish progress. The general body meeting ensures
public knowledge of the affairs of the VO and acts as deterrent against corruption. It sits on judgement on all complaints pertaining to members of the VO and its office bearers.

The role of the general body in achieving equitable, productive, sustainable development, and growth with social justice at the village level has been established beyond any doubt. It also acts as the most effective mechanism against hijacking of the VO by vested interests. It also takes away the burden of resolving VO disputes from the program staff and puts it fully and squarely in the court of the VO. This helps the program personnel to devote their time and energy to substantive matters of programming instead of getting involved in internal functionalism and power games of the VO. These disputes have to be resolved by the VO, as no outsider can do so. The program staff has to be patient. In some cases it takes years before such issues get settled. Decisions or solutions forced from above do not stand the test of time.

**Sustainability of Village Organization**

Another issue agitating the minds of development practitioners, is the question of VO sustainability. Why should the VO stay organized once its identified need, namely the PPI, has been fulfilled? As explained in the section dealing with PPI, there is an element of sustainability inherent in PPI as the catalyst for organization. If the PPI has to be maintained, to ensure continuing gains, the VO has to survive to perform this function.

However, what is more important and essential from the sustainability angle, is the development of a program package for implementation by the VO. It is here that the real challenge lies for the experts and specialists. The responsibility for developing viable packages, lies on the Management Group (MG), in the case of AKRSP. True the level of sophistication required for packages at the VO level is not high, but to develop packages acceptable to VOs, demands the highest level of expertise in the relevant field.

AKRSP has attempted to meet this challenge first by recruiting high calibre staff at the management level and second by drawing on outside experts within and outside the country, to help MG in developing packages in different fields. Without this input in the initial stages, until the VOs become self-reliant, sustainability of VOs would be highly vulnerable.

Another aspect of technical input for sustainability of VOs is grafting of scientific and technological improvements on existing traditional activities, be it in the field of engineering, agricultural practices, pastures and forestry, processing of fruits and orchard development, or the overall system of management at the village level. It is only when such grafting has been exploited fully that experts consider introducing a new package.

**Support Organizations for VOs**

It is for this reason that a support organization like AKRSP, becomes essential for fostering village organizations. Without the presence of such an administrative infrastructure, the VOs have little chance of survival. In Gilgit district, where AKRSP is now in its ninth year, the dropout rate of VOs, after completion of their PPI, has been insignificant. The increased productivity, human resource development, credit and banking, and marketing packages, both for men and women, held
enough attraction for the VOs, not only to sustain their interest but help them make significant strides in the economic field.

**Role of Village Activists**

The one factor paramount in sustainability of a VO is the presence or absence of a village activist. It is the activist, who helps the VO understand the vision of development; who gives his/her time and makes sacrifices to take program messages to the general body of the VO; who brings about changes in the management system of the village; who makes services being provided by AKRSP accessible to the VO members; who, in short, is the moving spirit behind the VO. Not a self sacrificing individual but one who sincerely wants to improve the situation of the co-villagers as well as his/her own. The VO provides the forum to achieve this objective. Without the VO forum, everyone in the village is left to their own devices to further their cause.

No wonder, individuals with some resources, connections and entrepreneurship, leave others, not so fortunate, far behind, a common phenomenon witnessed on the Pakistan rural scene. Our experience has shown that it is not impossible to find activists in the villages but they do need an institutional framework to come in bloom.

The success or failure of a VO is directly attributable to the VO activist, usually the manager of the organization. In most cases he is ably supported by the president. In addition, there is a cadre of village level specialists, trained by program staff and remunerated by the VO members, who help in implementing program packages.

Thus the actual responsibility for implementation of packages, is born by the VO through its cadre of trained specialists, namely, president and manager, livestock, plant protection, poultry, marketing, forestry, nursery, and so on. By way of illustration, a Social Organization Unit (SOU) of AKRSP, the lowest tier of its administrative infrastructure, comprising a social organizer (social scientist), a satellite social organizer and a unit engineer, has the support of nearly 350 to 500 rural cadres to implement and monitor program packages in 75 to 100 village organizations.

**Phasing Out**

As to at what stage and after how many years the administrative structure, in support of the VOs, could be phased out, is an issue requiring very careful examination and consideration. It has to be understood that the functions being performed by the support structure are of a permanent nature and would not disappear. For example, AKRSP, in addition to motivation for organization, is performing the functions of land development, agricultural development, credit and banking, and marketing support for the VOs.

Before it phases out, AKRSP will have to hand over these functions to some successor entities. It is difficult to predict, in specific terms, what shape these entities would require; however, one could analyse the development in this direction and identify the trends to make plausible proposals. An important development has been the realization by VOs of their capacity and strength to manage supply of inputs and credit, at the supra village level or VO cluster level and in
consequence formation of clusters of VOs to undertake these functions, instead of dependence on AKRSP staff.

The cluster would generate its own income through a service charge from the VO members, to pay their cluster and VO activists. This is the first step toward self-reliance, in terms of independence from the support structure of AKRSP. A second and more important step now in the offing is the setting up of a financial institution to take over the credit and banking functions, now being performed by AKRSP. This step has been made possible by the VOs, first by generating substantial capital (nearly Rs. 100 million) through savings and second by presenting an excellent track record of repayment of loans (97 percent).

Once a financial institution, owned, operated, and managed by VOs, comes into existence, the marketing and land development (now mostly on loans) functions could be entrusted either to a separate corporation or to divisions of the financial institution. Self financing is inherent in these activities. Even currently, AKRSP does not share in profit or loss of the VO marketing operations and after the first subsidized PPI, all subsequent land development undertaken by VOs is on loans, with a service charge.

It is AKRSP’s functions in the field of agricultural development, namely human resource development and agricultural trials and research, which need a much longer time frame for phasing out. Hopefully funding would be forthcoming to establish an institute of rural management and agricultural research to undertake these functions and to earn its keep by charging consultancy and training fees.

**Time Frame and Commitment**

We have reached this stage only because of the long-term commitment to AKRSP by its founder and patron and formulation of the program on well-established and time-tested principles of rural development. Without fulfillment of these two essential conditions, a program of rural development has little prospect of progress. Hopefully, in a time frame of 15 to 20 years, a program of rural development may succeed in fostering a self-reliant, self-sustaining, and economically viable rural society.

**The Question of Replicability**

Another major issue pertains to the replication of rural development programs. The question is often posed: is AKRSP replicable? There are two categories of people asking this question. One consists of skeptics and nonbelievers in the approach and the other of persons genuinely interested in finding a solution to the vexing question of replicability. To the former category whatever one may say, they have one reason or the other to remain unconvinced. One does share their concerns but not their pessimism. It is true that there have been too many cases of failure of rural development programs, when extended countrywide, but there are successful examples also, though few and far between. There is a need to examine the reasons for failures and the factors leading to successes. It is unfortunate that most people pass judgement without going into the merits of the case and more often base their views on superficial impressions or hearsay.
The founders of AKRSP had two objectives in view, namely, increasing the incomes of the small farmers of Northern Pakistan and developing a replicable model of rural development. With the latter objective in view, AKRSP did not confine itself to only a few villages. It operates on a canvas big enough to attract the attention of the governments. AKRSP is an NGO but by its sheer scale of operations, it aims at influencing government thinking to reorganize its administrative infrastructure to respond effectively to the demands of a genuine rural development program.

The Pakistan National Commission on Agriculture not only emphasized the need for an institutional framework of village organization for rural areas but also underscored the importance of a support organization to foster the village level institutions. In Northwest Frontier and Baluchistan Provinces of Pakistan, rural support organizations have been set up at the initiative of the governments concerned with bilateral assistance to try out the AKRSP methodology.

World Bank Evaluation

The World Bank Operations Evaluation Department in its interim evaluation of AKRSP in 1986 and again in 1989, addresses the issue of replicability at some length and again in its document "World Bank Experience of Rural Development: 1965-86", refers to the effectiveness of the process approach, followed by AKRSP, compared to the blueprint approach, followed by the majority of rural development programs all over the world.

Replicable Components of Rural Development

Every rural development program should consist of two components and the replication of these components could determine the viability of the program. In the case of AKRSP, the two components may be defined as the (a) conceptual package and (b) the program package. The conceptual package comprises the fundamental principles of rural development and is based on decades of experience of the world, which has stood the test of time and is, therefore, replicable in any region in any country, which has small farmers and subsistence holders. To make its success location specific, as in the case of AKRSP or to attribute sectarian and other factors as solely responsible for the success of the program would not be correct. My experience of implementing the AKRSP conceptual package, in four geographical locations, in three countries of the South Asian region, reinforces my conviction of the universal applicability of the package.

An important aspect of this package is the institutional model. The World Bank, in its 1986 evaluation of AKRSP, observed that the first 4 years of AKRSP, concentrating on the institutional model are 4 years missed in many rural development programs. Dr. Mahmood Hasan Khan of Simon Fraser University (Khan 1988) calls it the organization model and considers it an alternative to the capitalist and socialist models.

It is the program package component of rural development, which will have to evolve through the process approach, as referred to by the World Bank. For example, the program package of AKRSP is not necessarily replicable, because it was evolved by the VOs of the area, over a period of time, to meet their particular needs. Some of the other regions may have similar needs but as in the
case of PPI, the program staff could not determine, which VO needs what type of PPI, until it had undertaken a diagnostic survey, involving a series of dialogues with each and every VO. A similar analogy will apply to the evolution of a program package for a district or a region.

Leadership, Staffing, and Accountability

Some people feel that the staffing intensity required to undertake the diagnostic survey and the investment needed in the organization, in the shape of PPI, are not replicable. Besides, the need for dedicated staff and a charismatic leader make replication even more difficult, if not impossible. The World Bank also examined these issues and felt that none of these problems were insurmountable in case it is decided to replicate the AKRSP approach and a long-term commitment is made to this effect.

Perhaps no one would deny that for an innovative initiative, in any field, more effort and resources are needed compared to the routine; but once the trial, experimentation, and testing phase is over, extension, expansion, and replication of a successfully tested initiative does not need the same level of management or resource intensity as at the experimental or trial stage. If we test this hypothesis against the AKRSP experience, we find that a field level intensity of three professionals to a hundred VOs and an overall intensity of one professional to twenty VOs, is needed for purposes of motivation of villagers to form organizations and to stay organized, for the development of program packages, implementation, monitoring, and course corrections.

As to the availability of the professionals, willing and committed, even a backward and isolated area like Northern Pakistan, produced 95 percent of the staff from the area, who speak one of the local languages besides Urdu and English, and are second to none in terms of efficiency, commitment, and dedication. The two ingredients needed in the staff to implement an AKRSP type program are conviction and belief in the development approach and total accountability to the VO. The Bank called it "the primacy of the village." Any staff member, who loses confidence of the VO, knows that he has no place in AKRSP and the general manager would not condone such a lapse.

It is remarkable that there never have been spurious complaints against staff members by the VOs. Any complaint made was publicly substantiated leaving no scope for the staff members to hide behind lame excuses. The quality to listen to and respect the expertise of the villagers is instilled in the staff members right from the first day. It takes time to acquire these qualities and develop this attitude but the example set by the MG and the senior professionals, day in and day out, does succeed in molding the behavior of the staff in making them accountable.

The charismatic leadership, which is being given such a high premium, is nothing but an unambiguous understanding of the conceptual package and its implementation in letter and spirit. No compromise or expediency has a place here. The conceptual package is not difficult to understand and anyone with average intelligence can grasp its essentials but it needs a rigid discipline and conviction in its efficacy, bordering on fanaticism, to implement it. That there is no dearth of such people is clearly born out by the AKRSP experience.

The three district programs, after the initial input by the MG, in developing the program in Gilgit district, have faced no great difficulty in implementation, despite the MG's remote connection. The main input that the district programs require is in vertical expansion. The horizontal expansion has become a routine, requiring minimal supervision and input from the program leadership. The general manager's visits to the outlying district have not averaged more than three to four in a year.
Linkages and Coordination with Government, Social Sector Agencies, and Other Institutions

What linkages with government institutions, local councils, and existing agencies operating in the field of development are envisaged or could a program like AKRSP survive without such linkages? As the name indicates, the program is in support and not in substitution of existing services. If we examine the organization of government services, these are inadequate. But this inadequacy is further worsened because of the lack of accessibility to the available government services by the large majority of the rural population. There is, therefore, need for not only increasing the services by government but also to make these accessible, for example, setting up of credit institutions or operating new branches of banks, does not necessarily mean that credit becomes accessible to all the smallholders and subsistence farmers.

An AKRSP type program aims at rectifying the existing situation by first bringing the smallholders into an organized fold and giving them access to services which would normally be expected to come from the government. The most spectacular example of this type of access is the availability of credit to 66,000 plus small farmer families in the northern areas where 8 years ago only a few hundred had access to it. The number of credit institutions and branches of banks had remained almost the same in the area.

The agriculture, livestock, and forestry departments of government agreed to act as trainers for village level specialists, and whenever possible, pooled the supplies available at their disposal with AKRSP supplies to increase availability to villagers. There is a much greater scope of collaboration and linkages in this field, but it is a slow and tortuous process. A great understanding and more positive attitude can go a long way in achieving this objective. A clear cut government directive spelling out the scope of these linkages and collaboration could help in institutionalizing this process, which otherwise depends on the goodwill of the heads of the government departments or development agencies.

The main contribution of the program is fostering of an institutional framework at grassroots level. In doing so, the program does not tread on anyone’s territory. There is a vacuum and no agency is charged with this responsibility. Although, there is a clear realization of the need for community participation and involvement of the people in the process of development, there is a strange reluctance in development and government agencies to use VOs, as the vehicles for their development interventions.

In addition to a clear government directive on the subject, AKRSP needs to make a special effort to allay the misconception that the VO belongs to the program and the credit for any development done through the VO would belong to AKRSP. The VO, in fact, is a development forum for the whole village and any agency is welcome to go through it. The more agencies use it the stronger it will become. AKRSP, if the agencies so desire, welcomes the role of introducing the development agencies to the VO, and after the initial contact prefers direct interaction between the two without using the AKRSP conduit. A very good example of this advocacy has been the evolution of relationship between the VOs and the Northern Pakistan Primary Health Care Program and to a lesser degree between VOs and the Self-Help School Construction Program of the Aga Khan Education Services. Both these examples also prove the efficacy and potential of VOs as forums for both productive and social sector development interventions.
Role of Local Councils in Rural Development

Consistent and continuous attempts have been made in the past and are being made now to undertake rural development programs through local councils or elected representatives. No one decrēes the importance of local council structure in political education, in planning, implementation, and maintenance of infrastructure above village level, coordination with development departments of government and other agencies, taxation intervillage planning, and so on, but the structure is not an economic unit for undertaking rural development at the village level. This requires a broad-based structure at the microlevel, namely, an institutional framework of village level organizations.

The conceptual package for rural development demands and requires involvement of every smallholder in the process of development. Indirect or remote participation through an elected local councilor (or an elected representative) is not going to result in improving the economic situation of the rural poor of a village. It is not possible for the councilor (or the representative) to fulfill all the obligations of the smallholders for collective management, generation of capital through savings, and upgrading of human skills. This can only be achieved if every member of the rural interest group fully participates in these activities. No wonder that not only in Pakistan but even in India, with a highly developed Panchayati Raj System, the record of local councils in undertaking rural development has been dismal. The explanation that paucity of resources and lack of funds at the disposal of local councils are the main reasons for this failure, is not wholly true.

Women in Development

Women form half of the population and without their active involvement in the development process, not much can be achieved in ameliorating poverty or increasing the incomes of the family. In a conservative and traditional society any attempt to reach the women directly is met not only with resistance but also proves counterproductive. There is, therefore, first a need to educate the menfolk to involve the women in development. This is not an easy task. AKRSP experience has been that even where men were willing to involve the women, it was more to get benefits for themselves than to improve the situation of women. It is a long and difficult path to traverse. Many advisers and consultants advocated segregation of women through separate programs, but without first achieving emancipation of women, segregation does not work.

More so, in the case of AKRSP, which is a productive sector program, it was difficult to visualize program packages, which could neatly divide families, because such a unit is indivisible and works jointly for the common good of the members. Of course, some members of this unit are more equal than others and unfortunately women get discriminated against the so-called bread winners. Through learning by doing, a stage has now been reached, where even in the most conservative VO, there is no opposition to involving women in the development process. Of course this is on terms and conditions mutually acceptable, for example, women should be contacted by women staff, women should be trained in the village instead of being asked to travel to training centers, and so on. The evolution of the program package for women took into cognizance improvement of their existing situation, namely reduction of their work load and improvements in their productive capacity in the women's traditional work, for example, vegetable cultivation, poultry, fruit processing, spinning, and so on. We scrupulously avoided introducing exotic ideas and concentrated on helping women do what
they were already doing more productively. That this approach is paying off is clearly borne out by the achievements so far.

We also have been flexible in allowing women to either form a separate group or to merge their membership with the VO. As of September 30, 1991, 491 women's groups with 17,124 members and a savings of Rs. 13.06 million kept their identity separate, within overall umbrella of their respective VOs. Hundreds of other VOs participated in the women’s program package directly. Thousands of women got trained in poultry management, plant protection techniques, dehydration of apricots, management skills, and so on. The initial obstacle of identifying a PPI equivalent for women has now been overcome with the development of women’s packages. The challenge now is horizontal expansion, for which, the main constraint is women field staff. Although a cadre of women workers is slowly building up, however, because of the need for staff well-versed in local languages, the progress is slow. There is a continuous effort at innovative and alternative approaches to accelerate the expansion of proven packages for women.

**Difficulties, Obstacles, Failures and Successes**

When people visit developed countries like Japan or Germany, it is difficult to visualize what the situation must have been 100 or 150 years ago, which gave rise to the birth of Raiffeisen or the like and how the difficulties and handicaps were overcome by smallholders, to rise above the level of subsistence. It is human nature to gloss more on successes than failures and difficulties. No wonder, we are often asked this pointed question as to what difficulties and obstacles did we face in implementing the program in organizing people? What has been the failure rate of this successful program?

First let this be understood that it is too early to pass judgement on success or failure of AKRSP. Until the program attains its objective of sustainable development through a self reliant institutional framework of VOs, it is premature to claim credit. Time can only tell whether the initiative has been successful or otherwise. However, we can discern trends which give indications of the direction the program is going. Our offer of partnership to the villagers has received a positive response, but the journey is long and the destination is still a long way away.

What gives us hope and confidence is the large majority of VOs’ determination and resolve to move onward toward the destination. The percentage of VOs’ falling by the wayside has been very small. Of the nearly 1,500 VOs, only a few decided to disband themselves because of internal discord and factionalism. Of the 1,165 PPIs, initiated by VOs, only a few were a flop or abandoned and some are taking much longer to complete than what was originally stipulated but 846 PPIs have also been completed and are being satisfactorily maintained. More than 681 VOs have taken loans, on the strength of their savings, to initiate self-financed projects of land development, purchase of agricultural machinery, and so on. The cumulative savings of the VOs, kept in scheduled banks, amount to more than Rs. 98.68 million. In physical terms their achievements are impressive as evident from the following data through September 1991: construction of new irrigation channels--256 measuring 727 kilometers; widening and extension of irrigation channels--276 measuring 821.8 kilometers; link roads--200 measuring 634.3 kilometers; protective works--119 measuring 34,342 meters; and reservoirs and tanks--57 measuring 510,466 cubic meters.

However, their most impressive achievements have been in bringing about changes in the system of management at the village level. The cluster formation, referred to in the section 'Phasing
Out, is one example. Most of the other achievements referred to above would not have been possible without organization and collective management. The difficulties and obstacles faced in bringing about a behavioral change cannot be described in a few words. These difficulties are many and varied. Some have already been referred to, for example, the presence or absence of an activist in the village.

References


CLOSING SESSION
CLOSING REMARKS

Michel Petit*

Introduction

Let me begin by thanking all of those who have made this Symposium a great success, especially those from outside the Bank. While the Agricultural Symposium is oriented primarily toward Bank staff, those of you who do not belong to the Bank are nevertheless critical to the success of this activity. I also wish to thank the organizers, namely Jock Anderson, Cees de Haan, Dina Umali, and Pat Bielaski, each of whom has played a discrete and key role in the smooth operation of the proceedings. Finally, I want to thank Surinder Deol and the Training Division in Personnel Management for their collaboration, and express my desire that we continue this fruitful relationship for symposia in the future.

As for my topic, entitled "The World Bank Agricultural Strategy in Relation to Changing Public and Private Roles," I seek your indulgence not only because this is an impossible topic, but because I am likely to repeat things you have heard me say elsewhere, because we tend to return to the question of strategy for the agricultural sector on a regular basis.

The task of addressing strategy is, of course, difficult but necessary and, in fact, timely. The Agriculture and Rural Development Department (AGR), and therefore also the Agricultural Divisions through their input and collaboration, have been asked by the Board to review the sector in a formal paper to be delivered to the Board in September 1992. What the Board is really interested in is where the sector should, or is likely to, be going in the future. Thus, even though it is called a review, it is much more like a discussion on strategy for the sector. The Board is interested in reviewing all of the major sectors at least once every three years, and they want to begin with agriculture. While this could be a difficult exercise, I personally welcome it because in my three-and-one-half years at the Bank, I have never had a chance to discuss with the Board or with senior management issues of a strategic nature which we in this sector are facing.

There are some fairly senior people in this organization who tell me that the agricultural sector is in a state of crisis and that we lack a sense of strategy. The first question to ask is whether there can be a sector strategy for the Bank as a whole. I believe that, while we do need some strategic thinking for the organization overall, nothing will substitute for the need to conceptualize, design, formulate, and implement sector strategies at the country level. It is obvious to me that agricultural strategies are likely to vary tremendously from country to country and from Division to Division.

Let's concentrate on what can be said at the Bank level. On this I would like to address three main points. First I will briefly review what I consider to be the emerging issues, why we need to devise a new strategy. Second I will speak on the elements of an agricultural strategy for development. Third I will give particular attention to the role of governments, a theme of our symposium, and conclude by listing some issues we must resolve regarding the specific role of the Bank in this strategy. I will rely to a large extent on preliminary work that has been done by Peter Hazell.

* Director of Agriculture and Rural Development Department of the World Bank.
Emerging Issues

After decades of success, the Bank’s agricultural lending program is in a troubling state. Its share in total lending has fallen in recent years, and some types of agricultural lending, for instance toward the development of livestock production, have virtually disappeared. This decline was not planned and there is continuing debate as to whether or not it is appropriate. The environment in which agricultural projects are developed, and the implications this environment has for agricultural lending in the future, are clouded by a number of other issues, not the least of which is the steadily increasing failure rate of agricultural projects in recent years. According to the latest Operations Evaluation Department (OED) review, this failure rate stands at 52 percent, in particular among the integrated rural development, the agricultural credit, and the large-scale irrigation projects that have accounted for the bulk of the portfolio.

One problem regarding the environment of agricultural lending is the prevalence of depressed commodity prices on world markets. While we know that projections for the future are very uncertain, the future direction of world commodity prices hinges critically on the uncertain outcome of events such as the Uruguay Round of the GATT negotiations. More important perhaps would be unilateral policy reforms in the European Community, the United States, or Japan, or the liberalization and transformation of agriculture in Eastern Europe and the former Soviet Union. In brief the uncertainty about the outcome of these events is such that current price projections could prove seriously wrong. Still these projections point to prices that are declining or depressed and as long as this is the case, agricultural lending becomes more problematic.

Other factors that will affect the future of agricultural lending include population pressures on natural resources leading to serious degradation of soils, water, and trees in some areas, and the continuing debt and macroeconomic problems, which lead to a sharp curtailment of government expenditures, thereby reducing the financial support available to cover recurrent costs for agricultural institutions and for rural infrastructure.

We can add to these problems the fact that advances in technologies which increase yields have been less dramatic than before. Yield growth has tapered off in Asia, and the International Centers have yet to generate the elements of what could be a second Green Revolution, especially for rainfed farming systems, the prevalent farming systems in most of Sub-Saharan Africa. Finally changes in world climatic conditions, the ozone layer, and biotechnology may begin to have very significant but unpredictable effects on the pattern and scope of agriculture in less-developed countries within the next two to three decades.

Looking ahead two or three decades (a reasonable time frame, considering that this is the lifetime of many recent and currently planned projects), the Bank will be confronted with the difficulty of finding enough good projects to maintain a sizeable agricultural lending program in certain regions. We will be advising on policies and appraising loans under higher levels of uncertainty about future prices, technologies, and climatic conditions than has been the case in the past. And we will have to be increasingly concerned about sustainability issues and environmental costs, more so even than in the past.

Within this context, there should be no doubt that we need a comprehensive strategy for future agricultural lending, one which provides guidance on such issues as the types of agricultural investments and policies that are appropriate for the future, the relative importance that agriculture should receive in the Bank’s lending program, and perhaps most difficult, internal Bank changes that are required to ensure improved performance of agricultural projects. This is a tall order.
Elements of an Agricultural Strategy

What are the elements of an agricultural strategy? First we need to reassert that agricultural growth is important, and be quite specific in detailing why this is so. I’m not going to do that here because most of you are staff from the agricultural sector and you don’t need to be convinced of the argument. But clearly this is something that needs to be done again. The role of agricultural development in economic growth, employment generation, environmental protection, poverty alleviation, and food security, to name a few, will have to be spelled out. We will also have to explain why it is that, although agriculture declines in relative terms during the structural transformation of economic development, this does not mean that governments should neglect, or worse discriminate against, agriculture.

Second we need to outline the requirements for successful agricultural development. Here I will repeat only very briefly things that I said last year, that is, spell out conditions that have been detailed in our 1990 Annual Sector Review. In that review, we cited only three requirements, while today I will list four. The three previously listed are the development of appropriate technologies, the development of adequate institutions (including those which provide extension services, aid in bringing products to markets, and contribute to the management of natural resources), and the development of adequate economic incentives through the establishment of nondistortionary policies and ready access to domestic and international markets.

Regarding institutions, we know that in any sector the process of development requires human capital formation and social organization, for example, as we have just heard concerning the participatory approach and institutional development promoted by the Aga Khan Foundation in the northern areas of Pakistan. In reality institutional development applies to all four requirements.

The fourth requirement for successful agricultural development I wish to add has to do with the development of rural infrastructure, especially roads, irrigation, schools, health centers, and communications. The reason I add it now is not that we have neglected it in the past but that, given the present organization of the Bank, these subsectors are not completely covered by our sector, but instead are the purview of other departments within Sector and Operations Policy (OSP) and other divisions in the operations complex.

The third element of an agricultural strategy should be defining the role of the government. What lessons have we learned from this symposium? I was quite pleased that we had such a controversial keynote speaker, because he forced us to reflect on several fundamental issues. The discussion which followed Mr. ul Haq’s speech on Wednesday was quite interesting and raised important questions. The starting point, I believe, of our reflection on this subject was clearly a disillusionment with government, a clear sense of government failures, and the ensuing debate regarding governance as it relates to Bank operations. I wish to come back to this debate but I wanted to flag this because I believe the link to agriculture is very clear.

How do we agriculturalists view government failure? I hope you will forgive me for returning to the basics for a moment, please allow the old "prof" to lecture just a little! As technicians (and I include economists in this categorization), we tend to be nostalgic for governments, which model the enlightened dictatorship. I’m sure we all believe we have strong democratic values, but we give advice on the basis of our technical expertise and expect the governments to heed that advice. The best model in which this can occur is the enlightened dictatorship. We are in a sense the heirs of the French philosophers of the eighteenth century. Voltaire had a running correspondence with Katherine II of Russia and Frederick the Great of Prussia and among accounts of that correspondence is a quotation that I think expresses the notion of governance very well. Frederick
the Great said "the Prince is not the absolute master but only the first servant of his people." That is the kind of government that we would like to have, and we will give advice with confidence, expecting that the dictator, the prince, will be enlightened and, in the interest of the public good, will follow that advice.

Unfortunately, we have learned throughout the ages that not all dictators are enlightened, that their primary objective has not always, or should I say not often, been that of the public good. The fact is that we are struggling with the very difficult issue of the political relationship between public and private interests. As you know, political scientists, and social philosophers before them, have been struggling to find a solution to this problem. Historic progress was made when the United States chose its constitution, not an easy task as they devised one and then rejected it and wrote another. The fascinating progression of these thoughts is documented in the collection of essays known as the Federalist papers.

A look at the United States today, however, gives one the general impression that perhaps we have reached a stalemate between public good and private interest, a stalemate caused, perhaps, by the domination of private interests expressed through lobbying groups that may be too close to the political process for comfort. And these circumstances are not unique to the United States.

It has become apparent that the Marxist solution, that is the dictatorship of the proletariat, also failed to achieve the successes that were expected of it. Although on paper it seemed convincing, its greatest limitation, indeed perhaps ultimately the reason it failed, was the development in the Marxist states of what the Yugoslav writer Djilas called the New Class, what we now refer to as the "nomenklatura."

So today capitalism has primacy. I cannot resist the pleasure of calling your attention to a French author, Michel Albert, who wrote a book called Capitalists Against Capitalism. The thesis of the book is that the failure of communism is the victory of capitalism. But there are several forms of capitalism, and Michel Albert believes that we are witness to a struggle between two main forms of capitalism, the one he calls the New American Capitalism, probably embodied in such expressions as Reaganomics and Thatcherism, and the one he calls in French the "Capitalisme Rhenan," which means of the Rhine River, referring to the location of the key city where this brand of capitalism has been elaborated, and where the Socialist Party in Germany decided to abandon socialism some 20 or 30 years ago (at its Congress in Bad Godesberg).

I thought of this comparison as Mahbub ul Haq spoke to us, because the main difference between the two forms of capitalism, according to Michel Albert, is the pursuit of the social objective in Rhine River Capitalism. Pursuit of the social objective, including solidarity among groups within the society, is very different from the emphasis on individualism characterizing the New American model. Both models stress the importance of the market mechanism but propose different solutions for how those markets should be regulated.

What am I leading to? If I return to the pragmatic, I must admit that I don’t believe we have a blueprint in either social philosophy or political doctrine that will provide us with answers that are going to be useful to guide World Bank operations. So, in a sense I am disappointed, and sorry to disappoint you, that we have no simple, straightforward guidelines on what should be the proper role of government. We should not be surprised, therefore, that neither could the debate within the Bank answer this question. The Bank has very specific articles of agreement, based on the notion that one can separate politics from economics. This is, of course, a very difficult distinction to make, as we have learned from our own discussions the past few days.

I would suggest that we must base operations, the projects we undertake, the policy guidelines and recommendations we choose to make, on the concept of market failures and not government failures. In doing so, however, we must recognize that our attempts and government’s attempts to correct those market failures may, in fact, lead to government failures. We certainly do not believe,
and should not be led to believe, that governments are all powerful and are going to be able to correct all market failures. Nevertheless, to guide our actions, I believe the principle of addressing market failures to be the most productive one. Let me briefly review what I believe to be the three types of market failures.

Market Failures

Markets won’t work well, and will not bring about the public good, if monopoly power is unregulated. The concept of monopoly power doesn’t have much currency at the moment, but it continues to be a very important one, especially in rural areas. The other two concepts that are well known and receive more attention right now are those of externalities and the existence of public goods. The importance of externalities lies in the fact that often private costs and benefits will differ from social costs and benefits. These externalities arise from the possibility that the aggregate of individual decisions may not bring about the social, or public, good. We have seen this to be the case in many environmental issues. The existence of public goods, which cannot or should not be appropriated, lends itself to the argument that there is less than the socially optimum quantity of public goods being produced.

Those of you who were in the session on veterinary services will recall this argument in the discussion of the various kinds of veterinary services required and, in attempting to distinguish between those services that are best suited to private sector development, and those that should perhaps be provided by the government, or at least supervised or regulated closely by the government. You will also recall that there was a very interesting discussion allowing that, while the concept of distinguishing among types of services is appropriate, its practical application is delicate.

We also have had discussion regarding regulations as public goods in research and extension, and the possibility and implications of increased involvement of the private sector in these activities. In doing so, we are beginning to define more carefully just which activities are indeed public goods and which are not. Frankly when I listened to the discussion on the English and Welsh extension services, I wondered whether there is a risk of losing a public good. I later talked with Paul Ingram, and he suggested that by choosing to put advisers in remote areas where they are not likely to be compensated by the farmers, government may be seeking to satisfy the social optimum by providing more advisers for marginal farming.

I do not want to suggest that we have a simple recipe here. However, I believe that this point illustrates that the notion of public goods is worthwhile but that great intelligence will be required in deciding when and when not to provide them through government activity. We should be comforted by that conclusion, because if this could be done mechanically and did not require intelligence, the Bank would not need us! The solution, I believe, is to weigh the potential government failures against the existing or potential market failures.

Here, in this exercise of judgement, I would recall Mahbub ul Haq’s conclusion, that we must beware of ideology. I disagree with Michael Cernea’s assertion in the discussion that followed that, when you advocate the alleviation of poverty it is simply another ideology, not an ideal. There is a difference between an ideal and an ideology. An ideology is a system of thinking that presumes to give you solutions to practical problems and a way of organizing your ideas. This is what we must be wary of in our line of work.
Let me submit a very practical illustration of what I am talking about. I am absolutely convinced that there is a role for government involvement in agricultural credit. The presentation we by Jacob Yaron and Gershon Feder could be read in various ways, but Jacob's message clearly stated that, in some instances, government intervention is appropriate for the proper targeting of agricultural credit. It is also clear that, in many instances, these principles have been abused, but this is not sufficient cause to do away with them, only to exercise caution in their application.

I submit that our discussion this morning on the role of the Aga Khan Foundation suggests that we should look at farmers' organizations, cooperatives and other similar organizations more closely. There is clearly a public good which is performed by the Aga Khan Foundation in the northern areas of Pakistan, and which could be performed by governments and bureaucrats. What type of governments is another question, but we cannot abandon hope for government participation just because we have experienced so many failures in the past.

The Role of the World Bank

Let me come to my third and final point, that is, what are the consequences for the World Bank and its activities? I believe that the classification of Bank activities into three categories (those that enhance appropriate technologies, institutional development, and the management of natural resources) can be useful. Like all classifications, it has its limitations, for instance we are not going to be able to properly manage natural resources without simultaneously promoting new practices that may well require technological changes, and policy changes that provide incentives to those who must make the change.

We need to continue applying pressure for policy reforms because we have found that even when reforms are imposed, for instance in the case of structural adjustment loans, agriculture is too often left out of the equation, and in one way or another discrimination against agriculture continues. We also must be vigilant concerning natural resource management, as many of you who have been involved in the preparation of the Forest Policy Paper will appreciate (the completion of an Operational Directive on this sector is imminent, and I hope we can develop a smoother process of reconciling differences among interested parties on similar issues in the future). As you know, we have begun preparing a Water Resource Management Policy Paper. We also need to continue financing irrigation and drainage, an issue that we address in the 1991 Annual Agricultural Sector Review. Finally we must pursue in depth the issues of land and soil resources.

We need, perhaps with even more vigor than in the past, to promote technological change. As you know we are in the process of reassessing the relationship between the Bank and the international agricultural research centers (of the CGIAR), and while we have no intention of abandoning the CGIAR, there are serious issues surrounding these centers, which deserve our full attention. We will continue to support agricultural research in borrowing countries, a task not without its problems but one worthy of our attention, for example as we are giving to African national research through the Bank's continuing support of the Special Program for African Agricultural Research (SPAAR). The discussion on biotechnology demonstrated the importance of this activity and the high stakes involved, and the Bank will continue to include support of this activity in its agricultural strategy.

While I am glad to hear continued debate regarding extension and training and visitation (T&V), unfortunately this debate has taken on somewhat of an ideological character. I hope the
presentations and discussion over the past few days have contributed somewhat toward a resolution of the issues. It would seem that everybody agrees that there is a need for extension agents who will visit farmers, and that those extension agents have to be trained. What should be done and how it should be done, however, is still up for consideration. It is certain, whatever our opinions, that the Africa Region, which uses T&V as its model, has experienced diverse results from its application, some of which are very positive. The controversy, which continues to surround these issues, however, has to do not only with the effectiveness of what is being done, but with the bigger question concerning the role of the private versus the public sectors.

Let me conclude with what perhaps is the most delicate factor in defining the Bank’s role in agricultural development. In my notes from the proceedings of the past few days, I have points on regional variation and country specificity. In defining a strategy for the Bank as a whole, I do not mean to imply that it would be unnecessary to define a strategy at the country level. Indeed it is probably more important to do so at the country level than at the Bank level.

But this brings us to matters of internal procedures. We will need to improve our capacity to do interdisciplinary and intersectoral work. I hope that others would agree that the Agriculture and Rural Development Department has made some progress in this direction. The so-called NEXUS work in the Africa Region is similarly attempting to address the intersectoral issues. Yet in spite of these successes, I must say I underestimated the magnitude of this challenge when I joined the Bank. Clearly this is an area where further good and workable ideas will be welcome.

A more controversial subject perhaps has to do with whether or not agricultural lending by the Bank warrants spending more staff resources in the sector. There are some compelling arguments that say concentrating on the quality of programming is more important than the volume of lending to agriculture. Indeed in some instances we contribute more to development with less money and more intelligence. But the Bank prides itself on increasing significantly its volume of lending to special sectors or "areas of emphasis," and by doing so, the volume of lending has something to do with the amount of staff resources that go into related activities. Should we try to break that link? I'll leave that question for you, in your collective wisdom, to mull over. I ask you, however, to please let us know what you are thinking on this and other subjects, because AGR will most certainly need to take a position on behalf of the agricultural sector in the Bank.

Finally and also having to do with internal matters, there is the question of the management of our sectoral expertise. This relates particularly to our technical experts, and the set of skills we are able to offer to our borrowers through every aspect of lending operations and OSP support to operations. If we believe that something has to be done to properly manage these skills, and there seems to be strong agreement this is needed, then we may have to change our recruitment procedures. This is a most controversial topic and I know that there is no consensus in this room as to what, if anything, should be done about it.

Proper management also means that we will have to pay more attention to training existing staff, and on this we may have a consensus. As you know, we have an agricultural sector training group, and we are looking at this issue forthrightly and with what we hope is the entire spectrum of opinion represented. One of the tasks of managing our sectoral staff has to do with career profiles and development. Managers of the Bank cannot and must not ignore the most recent staff survey results, which showed that this was an area of discontent.

Let me conclude by saying that in this, as in anything and everything else that we do, we will only be able to make progress if we work together. We are in exactly the same position as the farmers of northern Pakistan, and need to be organized no less than they. I hope that AGR can be instrumental in helping us meet our sectoral objectives, and in representing the public good both inside and outside the Bank. Let us all work collectively to ensure that we are heading in the right direction.